

## **HK Electric's Response to the Public Consultation on Hong Kong's Climate Change Strategy and Action Agenda**

### **1. Introduction**

In September 2010 the Environmental Protection Department released a consultation document titled "Hong Kong's Climate Change Strategy and Action Agenda Consultation Document" (the Consultation Paper) for public comments on proposals to set for Hong Kong a target to reduce carbon intensity by 50-60% by 2020 with 2005 as the baseline and on an action agenda to further reduce local greenhouse gases (GHG) emissions through various means.

HK Electric supports the HKSAR Government's initiatives to combat global climate change and establish a visionary emission reduction target to outline the low carbon future for Hong Kong. This paper provides HK Electric's views on the Consultation Paper and on how HK Electric can help implement measures with a view to achieving the HKSAR Government's carbon reduction target.

### **2. Reducing GHG emissions to combat climate change**

The increasing observations of abnormal climate change in different parts of the world are disturbing. The climate change has been attributed to steep rise in GHG concentrations in atmosphere due to ubiquitous human activities.

The impact of climate change will be serious and its consequence can be devastating. According to the Stern Review on the Economics of Climate Change, a well known economic report presented by economist Sir Nicholas Stern for the British government in 2006, average global temperature is projected to rise by 2~3°C on current trends in the coming decades. Global warming can have severe impacts on people around the world in a wide variety of areas ranging from reduction in water supply, decline in crop yields, more widespread of vector-borne diseases and more extreme weather conditions.

There is no doubt that climate change is an unprecedented threat to global sustainable developments, and it is prudent and pragmatic for all human beings to start combating the change through reducing the GHG emissions. In 2007 the Intergovernmental Panel on Climate Change (IPCC), a scientific panel established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations, recommended that GHG concentration levels need to stabilize at 445 - 490 ppmv (part per million) CO<sub>2</sub> equivalent for there to be a fair chance to limit increase in average global temperature to 2°C. The current global atmospheric concentration of CO<sub>2</sub> has already reached 385 ppmv and hence emissions by developed nations will need to fall by 25-40% below 1990 level by 2020. Developing countries will also need to "substantially" reduce

their emission from a business-as-usual scenario by decoupling carbon emissions from economic growth and making transition to a low carbon economy through improving energy efficiency, changing fuel mix and decarbonizing other economic activities producing GHG emissions.

The HKSAR Government's proposed carbon intensity reduction target for Hong Kong of 50% - 60% below 2005 level by 2020 is expected to reduce the projected per capita GHG emissions by 3.6–4.5 tonnes of CO<sub>2</sub> equivalent, which representing a 27% – 42% reduction below the 1990 level can well demonstrate Hong Kong's efforts in working with the world community to combat global climate change.

The proposed target also reflects the role of Hong Kong in contributing to China's transition to a low carbon economy. China is a developing country and Hong Kong is one of her most developed cities. There are many developing provinces and regions in China whose economies still heavily rely on coal-based industries. Their transition to a low carbon economy will be more challenging. It is pragmatic that Hong Kong recognizes its responsibility as a far more developed city to work towards, and even surpass, the national carbon intensity reduction target, so as to support China's transition to a low-carbon economy with sustained economic growth.

Accordingly, HK Electric supports the HKSAR Government's proposed carbon intensity reduction target and transition to a low carbon economy. The proposal demonstrates Hong Kong's determination in contributing to both the national and the global reduction initiatives to combat climate change.

### **3. Decarbonizing electricity generation**

HK Electric considers that it is viable and practical to reduce the carbon footprint of electricity generation. This will play a key role for Hong Kong to pave its way to a low carbon economy.

Moving to a low carbon fuel mix for electricity generation will itself lower GHG emissions. On top of this, it can contribute to the decarbonization of other sectors through, for instance, increased use of high efficiency electrical appliances in the residential sector and electricity powered transportation systems in the transportation sector. The lowering of the emissions will also bring about the side, but equally significant, benefits of further improving the local air quality and the public health.

HK Electric has already made a head start to delivering reliable and low carbon electricity through the development of Liquefied Natural Gas (LNG) and renewable energy generation. We will continue our endeavor to achieve the ever challenging GHG emissions reduction target whilst maintaining a strategic fuel mix to ensure adequate and reliable supply of electricity to our customers at a reasonable cost.

### **4. Revamping fuel mix**

The need to revamp the fuel mix for electricity generation to a low carbon fuel mix is critical to the success of Hong Kong's transition to a low carbon economy. As regards the possible candidates that can contribute to the future low carbon fuel mix, HK Electric sets out our perspective below:

#### **4.1. Natural gas**

LNG is a low carbon emission fuel and one of the cleanest fuels available today. Using LNG to generate electricity could reduce carbon emission by as much as 50% of that from coal generated electricity. Its use also helps to enhance the quality of air that we breathe.

HK Electric has demonstrated its strong commitment to alleviating climate change and protecting the environment by investing and developing infrastructure to import LNG to Hong Kong to fuel its electricity generation since 2006 when it built Hong Kong's first LNG-fuelled combined cycle gas turbine Unit L9 in Lamma Power Station.

With the experience of Unit L9 which has brought significant carbon and emission performance improvement, HK Electric is able to support with confidence the government policy direction which requires natural gas to play a more essential role in Hong Kong's generation fuel mix. From 2010 about 30% of our total electricity generation will be fuelled by LNG, a remarkable increase from zero in 2005 and 6% in 2006. HK Electric firmly believe that the increasing use of natural gas through the bringing in of more nos. of modern and higher efficiency combined cycle gas turbine units can reduce carbon emission to mitigate climate change and lower overall fuel costs and diversify fuel sources to ensure energy security.

However, in order for Hong Kong to increase the share of natural gas in its fuel mix to 40%, HK Electric anticipates power companies in HKSAR will face challenges in securing natural gas supplies of sufficient flexibility to adapt to the changing pattern of local electricity consumption. HK Electric recognizes that the HKSAR Government's determination and commitment to overcome the challenge have been demonstrated by the signing of the Memorandum of Understanding on Energy Co-operation with the National Energy Administration in 2008. We urge and welcome the HKSAR Government to continue playing the role of a proactive facilitator to assist local power companies in overcoming possible hurdles in securing new and additional natural gas supplies. With the support of the HKSAR Government, HK Electric is hopeful that it can resolve additional natural gas supply problems to achieve the increased electricity generation by natural gas.

#### **4.2. Renewable energy**

HK Electric fully understands the aspiration of local community for increased application of renewable energy for electricity generation. However, the renewable energy potential capability in Hong Kong is both physically and geographically restricted. Hong Kong has no large river for hydropower, while both tidal and wave resources are too mild to deliver significant power supply even if the technologies now under research could be commercialized in future. Only wind and solar resources have some potential for commercial scale development.

Recognizing the importance of sustainable development and the pressing need to improve air quality in Hong Kong, HK Electric has pioneered in renewable energy and currently owns the largest wind and solar electricity generation facilities in Hong Kong.

#### ***4.2.1. Wind power***

Generating electricity by wind power can cut down use of fossil fuels, and contribute to the improvement of regional air quality.

HK Electric commissioned the Lamma Winds, Hong Kong's first grid-connected wind power station, in February 2006 at Tai Ling on Lamma Island. The 800kW wind turbine is the first commercial scale renewable energy facility ever built in Hong Kong. An exhibition centre on the development and application of various forms of renewable energy for education purpose was built in the Wind Turbine compound, which has become a distinct landmark and attraction for the public and tourists. By end 2010, Lamma Winds has generated more than 4 million kWh of green electricity offsetting more than 3,300 metric tonnes of carbon dioxide emissions.

Building upon the success and operating experience of the Lamma Winds, HK Electric is keen to expand wind energy application in Hong Kong by planning to develop a 100MW class offshore wind farm on Hong Kong's territorial waters. This is part of our commitment to combat climate change and is also a response to the HKSAR Government's First Sustainable Energy Strategy for Hong Kong.

Subject to the approval of the HKSAR Government, the proposed 100MW class offshore wind farm is scheduled for completion by 2015. It is envisaged that around 30 sets of 2.3 – 3.6MW class wind turbine will be erected over a total of about 600 hectares water surface. Those turbines will be interconnected by cables for connecting to HK Electric's power grid and will produce about 170 million kWh of green electricity each year adequate to meet the consumption for 50,000 families. The green electricity so generated is roughly around 1.6% of HK Electric's total electricity sales in 2008 and will offset 150,000 metric tonnes of carbon dioxide emissions every year over the 25 years of its operating lifetime.

#### ***4.2.2. Solar power applying home grown photovoltaic (PV) technology***

Solar power is a source of renewable energy and can be captured by photovoltaic (PV) cells for electricity generation. In July 2010, HK Electric commissioned the largest PV system in Hong Kong. The installation is based on the amorphous silicon thin film PV technology developed by a local high tech establishment under the "Shenzhen – Hong Kong Innovation Circle" agreement signed between the HKSAR Government and People's Government of Shenzhen Municipality. As compared to crystalline PV cells, amorphous silicon thin film PV cells are considered more environmentally friendly in production and are more cost competitive for applications especially in tropical areas due to better performance in electricity production.

Taking into account the layout and technical factors, the PV system has been installed on the roofs of Main Station Building of Lamma Power Station with a total of 5,500 modules of amorphous thin film PV cells which makes up a total peak capacity of 550kW. The PV system produces more than 620,000 kWh of green electricity annually, offsetting about 550 tonnes of carbon dioxide emissions every year for its 25 years life span.

HK Electric is investigating the feasibility of further expanding its PV system to achieve more solar power generation at Lamma Power Station.

#### ***4.2.3. Inherent Limitations***

Based on our experience, there are inherent limitations to wider application of wind and solar power in Hong Kong, such as weather conditions which affect the amount of electricity generated.

As such, HK Electric considers the proposed target of 3-4% renewable energy in the proposed fuel mix by 2020 very challenging. Nonetheless, as a staunch supporter of renewable energy, HK Electric is willing to take up the challenge to help Hong Kong meeting the proposed renewable energy target.

### **4.3. Nuclear power**

HK Electric fully appreciates the public's concerns about the safety and supply reliability issues associated with nuclear power. On the other hand, HK Electric also recognizes the important potential of nuclear power as a major constituent of Hong Kong's fuel mix for electricity generation and the significant contributions it can have to reduce carbon emissions.

#### ***4.3.1. Comparison with other fuel mix options***

Today nuclear generation is the only large scale low carbon option available for base load operation. Wind and solar generation is by nature intermittent and unpredictable. They need other controllable generation, like fossil-fuel generation to back up for reliable system operation.

Similar to renewable energy, nuclear energy has zero emission (including GHG) during electricity generation and very low life-cycle GHG emissions. This makes nuclear energy an appealing option as compared to natural gas. Although natural gas generation is more carbon friendly than coal generation, GHG will still be emitted from the generation process. By comparison, introduction of nuclear generation to replace coal generation will bring even larger carbon reduction by totally eliminating the emissions and hence enabling Hong Kong to achieve a level of carbon reduction which is otherwise not achievable with other forms of fossil-fuel electricity generation.

#### ***4.3.2. Safety and reliability***

With improving technologies and cumulating operational experience (some 14,000 reactor-years of commercial operation in 32 countries according to the World Nuclear Association), nuclear power has a proven track record that it can be a safe and reliable energy source. Hong Kong has been importing nuclear power from Daya Bay Nuclear Power Station since 1994 and will be able to draw reference to its successful experience to manage the risks associated with the development and operation of nuclear power.

In order to provide the necessary comfort and confidence to the public who are concerned with importing additional nuclear power from Guangdong, the two Hong

Kong power companies should be allowed to participate throughout the design, construction, operation and management of the new nuclear power station and associated dedicated transmission facilities required for the safe and reliable import of nuclear power.

### ***4.3.3. A feasible option***

If Hong Kong is going to reduce the share of coal in its generation fuel mix to below 10% without increasing the share of nuclear import currently at around 20%, the share of natural gas will have to be increased to around 70% in the generation fuel mix. However, the 20% nuclear + 70% gas + 10% coal generation fuel mix will emit much more GHG as compared with the 50% nuclear + 40% gas + 10% coal generation fuel mix. Introduction of more nuclear power to Hong Kong can also help to alleviate the potential risks of over-reliance on natural gas, the demand and market prices of which are ever rising.

Overall, HK Electric considers that it is feasible for Hong Kong to import a large quantity of nuclear power from Guangdong, which is pursuing an aggressive nuclear target to have 24,000MW nuclear capacity installed and 10,000MW nuclear capacity under construction by 2020 in the current planning regime. These targets will likely be revised upward in the future planning regime. With Central People's Government's support and Guangdong Provincial Government's close coordination and support, it is reasonable and pragmatic for Hong Kong to pursue the proposed 50% nuclear fuel mix target.

The feasibility of nuclear power can also be demonstrated in terms of its anticipated impact on electricity tariff. Tariff for nuclear power is likely to be more stable than tariff for coal or LNG. Fuel (uranium) price has a relatively small impact on cost of nuclear power generation when compared to other technologies like natural gas generation. According to the McKinsey report "Reducing U.S. Greenhouse Gas Emissions: How Much at What Costs?" published in 2007, nuclear option offers lower cost of abatement of carbon emissions when compared to carbon capture and storage (CCS) and renewable energy options.

HK Electric has analysed the domestic tariff of 3 western continental European countries represented by those in their respective capital cities, viz. France (Paris), Germany (Berlin), and Italy (Rome). These are highly developed Euro Zone countries and have installed nuclear power generation to a different extent. France has 76% of its electricity generated by nuclear power, Germany 23% and Italy nil. As shown in the table below, barring other factors, countries with electricity generated from nuclear sources appear to have lower and more stable tariffs than those without, despite huge price volatility of fossil fuels in the period of 2007 - 2010. In general, the larger the portion of nuclear generation, the lower and more stable the tariffs.

<b>Comparison of Residential Tariffs - By Average Electricity Price <sup>1</sup> (for Monthly Consumption = 300 Units)</b>			
Country Capital City	France Paris	Germany Berlin	Italy Rome
Utility	Electricité de France	Vattenfall Europe	Enel SPA
	€/kWh	€/kWh	€/kWh
2005	0.114	0.161	0.155
2006	0.114	0.165	0.183
2007	0.117	0.177	0.184
2008	0.119	0.173	0.206
2009	0.108	0.173	0.193
2010	0.110	0.184	0.181
2005-2010 Average	0.114	0.172	0.184
<b>Residential Tariffs Index (Year 2005=100)</b>			
2005	100	100	100
2006	100	102	118
2007	103	110	118
2008	105	108	133
2009	94	108	124
2010	96	114	117

Source: Websites of respective utilities

1. Average net electricity tariff in November of respective years for a monthly consumption of 300kWh.

Participating in Mainland's nuclear development program also offers Hong Kong an opportunity not only to develop its engineering and management professions but also to enhance its cross-border economic cooperation with the Mainland.

As for any other generating facilities, there is a long lead time for the planning, construction and development of the nuclear power plants and the associated dedicated transmission facilities. These power infrastructures are also huge investments and involve very long investment horizon. To materialize the investments in the infrastructures so that Hong Kong can benefit from increased nuclear power import, it is necessary to have a stable and well proven regulatory regime with long-term certainty to encourage investors to plan for and to commit to the long-term investments.

Clearly, the import of large quantity of nuclear power from Guangdong Province will significantly contribute to GHG emissions reduction but it will be a very challenging mission. Its success will require the close cooperation and support of the Central People's Government, the Guangdong Provincial Government and the HKSAR Government, as well as stakeholders in Guangdong and Hong Kong.

## **5. Energy efficiency and conservation**

Energy efficiency and conservation are low hanging fruit for carbon reduction. The HKSAR Government estimated that for new buildings, the implementation of the Mandatory Building Energy Codes will result in energy savings of 2.8 billion kWh and reduction of 1.96 million tonnes of CO<sub>2</sub> emissions in ten years (about 0.7% of total electricity consumption per year). Using electricity in an efficient and responsible manner is beneficial to the environment.

HK Electric fully supports that the community should conserve energy to reduce local GHG emissions. As one of the key players of the Hong Kong energy market, HK Electric has been promoting energy efficiency and conservation to the public through various initiatives including the Smart Power Campaign, the Clean Energy Fund and the Energy Efficiency Education Fund, and the provision of free energy audit services to our customers. Within the company, HK Electric has also set up CSR Committee and Environment Committee to steer and coordinate all corporate social responsibility and environmental initiatives and to encourage greener practices among our staff.

## **6. Green transport**

HK Electric is a supporter of green transport and has been proactive in introducing electric vehicles to the company fleet since 1984. In 2010, HK Electric bought 10 Mitsubishi i MiEV electric vehicles and 2 Smith electric mini-buses for the company fleet and made available another 10 iMiEV electric vehicles for leasing by corporate customers on contract terms. Besides, HK Electric has been working closely with the HKSAR Government and other stakeholders to encourage wider use of electric vehicles by setting up charging stations at popular public car parks on the HK Island and quick charging facility in its premises.

## **7. Preparing for necessary adaptation**

HK Electric is fully aware of the impacts of climate change not only on our business but also on the sustainable development of the Hong Kong society. We support the proposed adaptation options listed out in the Consultation Paper in principle and will carefully consider the appropriate implementation plans based on the proposed framework.



## **8. Concluding remarks**

In summary, HK Electric supports HKSAR Government's proposed GHG emissions reduction initiatives and the setting of a carbon intensity reduction target for Hong Kong which will surpass the national target. Hong Kong already has a low carbon intensity level and to achieve the proposed 50-60% carbon intensity reduction target within a relatively short timeframe by 2020 will be a challenging exercise. We are ever mindful that the need to reduce GHG emissions for combating climate change makes this exercise an important and worthwhile cause.

Provided that a reasonable lead time and policy supports are available, HK Electric considers the HKSAR Government's proposed electricity fuel mix revamping a viable strategy to achieve carbon intensity reduction. However, given the significant impact of the proposed fuel mix on the electricity market in the coming decades, more detailed study and closer collaboration with Hong Kong and Mainland stakeholders should be carried out and the current stable and well-proven regulatory framework should continue to enable power companies to make long term and prudent energy infrastructure investments.

HK Electric is also committed to increased use of renewable energies such as wind power and solar power to help cut down GHG emissions. Our pioneer wind project on Lamma Island and the largest solar power project in Hong Kong together with the plan for a new 100MW class off-shore wind project and the expansion of the thin film PV project at Lamma Power Station pave the way for our endeavour to increase renewable energies to attain the electricity fuel mix as proposed by the HKSAR Government.

To encourage people to live a low carbon life, HK Electric will continue to promote sustainable development and energy conservation to the public through a number of initiatives, such as electrification of the transportation sector and improvement in energy efficiency of all sectors of the community.

HK Electric looks forward to working closely and collaboratively with the HKSAR Government and all other stakeholders towards achieving the carbon intensity reduction target by 2020.

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