Towards a Greener Pearl River Delta

A Roadmap for Reliable Clean Energy Generation for Hong Kong
Our Energy Vision

“Towards a Greener Pearl River Delta (PRD) – A Roadmap for Clean Energy Generation for Hong Kong”, first published in 2009, outlines CLP Power Hong Kong’s (CLP) vision for energy for the next decade. Our vision encompasses closer energy integration with the Mainland; moving to cleaner fuels; and encouraging greater energy efficiency. For the future of Hong Kong, we believe securing CLP’s energy vision is an important step on the road to a more sustainable energy future.

In this update, we highlight key developments since 2009 that have started to bring our vision into reality. We understand the community’s aspiration for improved air quality for Hong Kong, and we are committed to playing a key role in this important cause. Our goal is to work closely with all concerned parties to build a greener home for all – in Hong Kong and the PRD.

CLP is committed to maintaining world-class reliability in supplying electricity to Hong Kong. This commitment is underpinned by our energy vision, which is described in the following sections.

“CLP’s energy vision is an important step on the road to a more sustainable energy future”
With economic cooperation throughout the PRD growing fast, infrastructure planning and development is also becoming more integrated in order to support growth in both Hong Kong and Guangdong. Energy supplies are no exception, and their integration is just as important as other regionally developing areas such as transportation.

CLP’s electricity transmission network is already securely linked to Guangdong and it allows us to import nuclear power from Daya Bay and supply power from Hong Kong to Guangdong. In addition, the 800-km pipeline between Hainan and the Black Point Power Station (BPPS) has been providing us with natural gas to generate clean power for our Hong Kong customers since 1996.

Our Hainan gas supply is depleting fast and to secure natural gas supplies for the future, the Hong Kong SAR Government and the Central Government signed a Memorandum of Understanding (MOU) on energy cooperation in August 2008. Implementation of the MOU is underway to bring in long term gas supplies from three new sources in the Mainland. As the first step, a 20-km subsea pipeline connecting the launching station in Dachan Island, Shenzhen and a new gas receiving station at BPPS was built, to bring gas from Central Asia to Hong Kong via the 9,000-km second West-to-East pipeline in 2013. Further new supply options such as a new liquefied natural gas terminal to be developed in Shenzhen as well as gas from new fields in the South China Sea are being explored. These new sources will provide us with a greater long term supply of clean fuel for Hong Kong, albeit at much higher prices than our fast-depleting Yacheng supply, which was contracted 20 years ago.

“As economic integration accelerates, strengthening reliable electrical and energy infrastructure links between Hong Kong and the PRD will provide mutual benefits”
Adopting a Cleaner Fuel Mix for Cleaner Air

CLP fully supports the Government’s plan to improve Hong Kong’s air quality, and we are committed to adopting a cleaner fuel mix featuring four key initiatives:

- Using more gas for local power generation
- Importing nuclear energy to meet base load requirements
- Reducing our reliance on coal to further cut emissions
- Promoting practicable local renewable energy sources

“To date, our use of natural gas and nuclear power has contributed to better environmental performance, and we will continue our efforts to increase the proportion of clean fuels in our generation portfolio.”

Using more gas for local power generation

In 1996, CLP became the first electricity supplier to bring natural gas to Hong Kong for power generation. Natural gas is a clean-burning fuel that produces much lower levels of emissions of sulphur dioxide, nitrogen oxide, particulates and carbon dioxide than most other fossil fuels. Over the years, the use of natural gas has helped CLP reduce emissions from its operations.

We expect the proportion of gas-fired local generation will increase significantly over the next few years to about double the current level so as to meet the new 2015 emission caps for our power stations. This planned change is in line with the Government’s proposed initiatives to deliver the Air Quality Objectives (AQO) by raising the proportion of gas-burning in local electricity generation. With this goal in mind, we are also assessing the options to provide the most efficient and economical gas-firing capacity in Hong Kong.

The potential for nuclear energy to meet base load requirements

Nuclear energy is clean. CLP is the first electricity supplier to have brought nuclear energy to Hong Kong. We have been supplying almost 30% of our customers’ needs for almost 20 years by importing it from the Daya Bay Nuclear Power Station in Shenzhen, which has operated in a very safe and reliable manner since 1994.

The MOU also contemplated the ongoing supply of nuclear electricity to Hong Kong. In 2009, CLP successfully extended the current nuclear power supply contract for 20 years to 2034. This enables the continued supply of non-carbon emitting electricity to Hong Kong. Compared to coal, this has avoided the equivalent of over 10 million tonnes of CO2 a year, equivalent to planting at least 400 million trees occupying an area which is about 4 times that of Hong Kong.

Government and the wider community will soon need to reach a decision on the proposed fuel mix for the next decade. Subject to community consensus and Government’s decision, additional
nuclear energy could be imported to meet base load requirements as new supplies become available from the Mainland. In this scenario, enhancement of the existing transmission infrastructure or new dedicated transmission infrastructure to connect CLP’s grid with the new sources of nuclear supply would be needed to deliver such new supplies to Hong Kong.

Reducing reliance on coal to further cut emissions

As supplies of cleaner natural gas and nuclear energy increase in the future, we will be able to reduce coal-based generation, using it mainly to meet demand fluctuations and as a back-up to ensure supply reliability in case of interruptions arising from the electricity transmission network in South China. Maintaining a certain level of coal-burning capability within our system is also important for reducing our exposure to gas or other energy supply interruptions or volatility, to help maintain electricity supply reliability.

Within our future generation portfolio, coal will still have a part to play but it must be as clean as possible. As an immediate measure to help minimize emissions, we have retrofitted the largest four units of the coal-fired Castle Peak Power Station with flue gas desulphurisation and nitrogen oxides reduction facilities to meet the current European standards. We shall continue to explore opportunities in optimizing our emission performance as new technologies become commercially available.

Promoting local renewable energy sources

Given Hong Kong’s densely populated urban environment and the nature of our terrain, there is limited potential for Hong Kong to develop significant land-based renewable energy projects. However, developing wind resources offshore is a possible alternative. CLP is keen to explore this new technology for Hong Kong on a wider scale, although such a move would involve economic and environmental trade-offs. CLP is studying the feasibility of developing an offshore wind farm in the south-eastern waters of Hong Kong. We are in the process of collecting wind, wave and other environmental data for completing the feasibility study and will engage with the community on the appropriate way forward.

While large-scale land-based projects of this kind prove challenging, there is still the possibility of smaller-scale, renewable “micro-generation” in Hong Kong – in schools, on rooftops, in homes and other community facilities. We are supporting these smaller systems with easy connections to our grid and providing free technical advice. Furthermore, CLP has developed Hong Kong’s first commercial standalone renewable energy system on Town Island. The entire project, carrying a total capacity of 200kW and involving over 600 solar panels and two wind turbines was completed in 2012.

A cleaner fuel mix for cleaner air

All of these initiatives will help CLP to redefine the role of coal in our fuel mix for electricity generation. The use of coal will be increasingly reserved to help maintain steady and reliable electricity supplies in the future. CLP will play our part in the efforts to combat air pollution and climate change in Hong Kong and continue to strive for an excellent emissions performance record. We are confident that our roadmap for reshaping our fuel mix will yield important and positive results for Hong Kong’s air quality.
Promoting Energy Efficiency

Saving energy helps our environment, so we all need to do our part and use energy more wisely. A little contribution by each of us can make a big difference. We have worked hard to encourage our customers and the Hong Kong community as a whole to change their behaviour so that they save energy and adopt new technologies which can use energy more efficiently, so as to support a better environment. We have taken a four-step approach: educating the public; providing customers with information and energy-saving tips; equipping customers with tools and technical support; and helping with enablers to make greater energy efficiency possible. A wide range of services are available to our Hong Kong customers – visit our website www.clponline.com.hk to see how you can do more – in your home or in your business.

Building on the initial provision of energy-saving services to the PRD with the establishment of CLP Energy Services & Technology (Shenzhen) Co. Ltd. in 2008, a joint venture company CGN CLP Energy Services (Shenzhen) Co. Ltd. was established in 2011 so that we can advise a wider range of companies in Guangdong on cleaner production and energy efficiency. Many of these organizations have strong connections with Hong Kong and we are working with hotels, office buildings and factories to enhance their environmental performance.

CLP Energy Saving Support

For Homes

Education
- Electric Green Studio
- Energy Innovation Project Competition
- Exhibitions and Promotion
- “Let’s Save Now For a Better Future” Campaign

Information
- Energy use information on electricity bill
- Green Home Starter Guide
- Green Information Hub on CLP Online

Tools / Support
- Eco Home
- Eco Optimizer
- CLP Mobile App
- CLP Eco Ambassadors

Enablers
- Advanced Metering Infrastructure (AMI)
- Energy and Carbon Calculator on CLP Online

For Businesses

Education
- Energy Efficiency Exhibition Centre
- Energy Efficiency and Conservation Workshops
- GREENPLUS Recognition Award

Information
- Green Enterprise Info Pack
- Meter Online
- Green Information Hub on CLP Online

Tools / Support
- GREENPLUS Programme, GREENPLUS Gallery and GREENPLUS Resort
- GREENPLUS Energy Billboard
- Account Manager

Enablers
- Advanced Metering Infrastructure (AMI)
- Energy Efficiency Loan Scheme
- Energy Audit Services
- Energy Calculator on CLP Online

For more CLP energy saving support initiatives, please click to www.clponline.com.hk
CLP has been supplying customers with reliable, safe, value-for-money electricity for the last hundred years. For the next hundred years, and for the benefit of our children, we believe that Hong Kong needs a clear policy to meet our energy needs. We suggest that this policy is built on a reliable and safe supply, produced in an environmentally responsible way and at reasonable tariffs. These three core policy ingredients comprise what we term the ‘energy trilemma’. Hong Kong, like many other countries, faces significant energy challenges in balancing the three ingredients in the energy trilemma because there are obvious tensions between them. A careful balance has to be made in order to achieve an optimal outcome so that the best interests of society can be served as a whole.

Reliable and Safe Supply

- Hong Kong’s way of life depends on a highly reliable electricity supply. Our customers tell us that this is their number one priority from CLP.
- Hong Kong’s supply reliability is world class and this is managed within the SAR. It is common for developed economies to set a minimum proportion of local generating capacity, essential to maintain energy security. Singapore (100%) and New York (over 80%) are examples.
- Without control of generation capacity – either locally or on the Mainland with a dedicated link and the ability to decouple from the Guangdong grid – current reliability could be compromised.
- Over time we could consider strengthening the interconnection and importing more clean energy from the Mainland, as long as this will not impact supply reliability and will bring economic benefits.

Care for the Environment

- When considering the appropriate fuel mix for Hong Kong, we need to be mindful of the environmental impacts of different fuels and the dual need to improve air quality whilst addressing climate change.
- More complex challenges need to be met if we were to import additional electricity supplies from the Mainland, where coal is the marginal fuel. Designated nuclear or renewable energy generation and the necessary secure transmission facilities would need to be available, with the appropriate lead time for delivery, if overall emissions are not to increase or simply transfer from Hong Kong to the Mainland.

Costs

- In Hong Kong, fossil fuels are priced by international markets and have been very volatile over the past 10 years, posing significant challenges in managing fuel costs. Our Daya Bay nuclear import price has been remarkably stable, below the level of local inflation, thereby helping to keep tariff increases to the minimum.
- Fuel prices vary significantly. Having the option to use more of one fuel or less of another at any one time can help to keep our generation costs lower. Keeping the option open to use a diversity of fuels and different generation technologies is therefore important.
- The unit cost for generating electricity with cleaner fuels is generally higher. So, changing the fuel mix has significant cost implications for customers.

Going forward, the next few years will see significantly increased fuel costs due to more and higher priced gas consumption to meet Government’s environmental policy requirements. This trend towards higher fuel costs will remain under any new fuel mix determined by the Government and the community for the next decade. The challenge is to make any changes whilst maintaining a reliable and safe supply of power in an environmentally responsible manner and to a practical timescale that the community endorses, at a cost that it is prepared to pay. CLP will play our part to support the direction adopted, using our expertise to continue to deliver reliable supplies to our customers.
Electricity Generation Fuel Mix For Hong Kong

All fuels used for electricity generation have unique properties – strengths in some areas and weaknesses in others. In moving to a new fuel mix, the community needs to carefully consider these characteristics.

**Coal**  Coal-fired generation provides high reliability, a relatively quick response to meet changes in demand and a relatively low generation cost. Its high CO₂ and relatively higher air emissions require additional abatement measures compared to other fuels.

**Natural Gas**  Gas-fired generation provides high reliability and a very quick response to meet changes in demand. It outperforms coal in emission performance (with about half the CO₂ emission, a quarter of the NOₓ emission, and nearly nil emissions of SO₂ and particulates) but with a significantly higher generation cost. World demand for gas is increasing given its environmental benefits.

**Nuclear**  Nuclear energy has the advantage of high reliability, large scale steady base-load generation, virtually zero CO₂ and other air emissions, all at a very competitive generation cost. It requires sophisticated and careful operational safety and waste management. CLP takes its supplies from the Daya Bay Nuclear Power Station which has been providing stable and safe supplies of electricity to Hong Kong for almost 20 years. However, post the Fukushima incident, public concern over nuclear safety still remains.

**Renewable Energy**  Renewable energy has a role to play in the world’s fuel mix, and where there are good natural resource levels of renewable energy available (e.g. hydro in British Columbia, wind in Australia or solar in Arizona), it is gaining in popularity due to its emission-free attributes. However, good levels of resource are not available everywhere (e.g. in Hong Kong) and current drawbacks include the much higher generation cost, the large amount of land required and its intermittent nature that requires back-up from conventional fossil fuel generation.

There is no perfect fuel and Hong Kong needs to consider carefully the preferred changes for the fuel mix needed to take us into the next decade. Such changes will require careful planning and additional investment will come at a cost and will take time to deliver. We believe a range of fuel types and supply options can provide a balanced solution towards reducing CO₂ and other air emissions whilst ensuring supply reliability and reasonable tariffs. A clear, long term energy policy is vital to enable the best Energy Trilemma outcome for Hong Kong.
CLP has been supplying customers with a safe and reliable supply of electricity, with an improving environmental performance at reasonable prices:

How Do We Measure Up Against the Energy Trilemma?

The provision of a reliable and safe supply of electricity

- Hong Kong enjoys one of the most reliable power supplies in the world
- CLP’s supply reliability exceeds 99.999%, which is amongst the world’s best
- The time of power interruption experienced by our customers is much less than that of other major cities such as New York, Sydney and London

With minimal environmental impact for the benefit of all in Hong Kong

- Our emissions of sulphur dioxide, nitrogen oxide and respirable suspended particulates have been reduced by over 80% since 1990 despite an electricity demand increase of 80%. For carbon intensity, the 2012 level is 0.58kg CO₂ per kWh, below the 1990 level by about 40%
- Emissions have been reduced through the import of nuclear power, increased use of natural gas, installation of emission control facilities at our coal-fired power plant, and use of low emissions coal
- Emissions will continue to reduce in the next few years

At reasonable prices

- Despite significant fuel cost pressure, our tariff is amongst the lowest among the major metropolitan cities around the world, with the average basic tariff lower than that of a decade ago, as a result of prudent cost management
Hong Kong needs a very reliable supply of electricity. The current balanced fuel mix of gas, coal and nuclear has served Hong Kong well, providing a very reliable electricity supply and giving us the flexibility to change our actual fuel mix year by year to optimise fuel costs and help manage tariffs. Great care and detailed planning are needed if this balanced portfolio of energy sources is to be changed significantly, to ensure that reliability can be maintained.

The Government is expected to consult the community on the fuel mix to be used for electricity generation. CLP will provide information on the options available and we will do whatever we can to help our community determine an appropriate policy. Our energy vision is both a commitment to the future and a flexible pathway to achieving it, one we believe is capable of adaptation to ensure that we can successfully implement whatever the Government determines is the most appropriate future fuel mix for Hong Kong.

To continue turning our vision into reality, to deliver the Government’s fuel mix policy and to build a greener home for many generations to come, we need everyone’s support. Collectively, we can make a lasting positive impact. We have already made progress but we know that there is a lot more to be done. This will take time but our roadmap on how to achieve a reliable and clean electricity supply for Hong Kong is available for all to see at www.clp.com.hk/OurEnergyVision. Let’s work together to build a greener Hong Kong and Pearl River Delta.
Working Together for a Greener Home
CLEAN
ENERGY
FUTURE
GREEN

CLP

CLP Power Hong Kong Limited
8 Laguna Verde Avenue, Hung Hom, Kowloon, Hong Kong
Tel: (852) 2678 8111
Fax: (852) 2760 4448
www.clp.com.hk

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