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Public Consultation on Future Fuel Mix for Electricity Generation

Purpose

This paper informs Members of a 3-month public consultation on the Future Fuel Mix for Electricity Generation that the Administration launched on 19 March 2014. A copy of the consultation document is at **Annex A**.

Details

2. In order to facilitate timely planning of necessary infrastructure to meet the future electricity demand when existing coal-fired generating units start to retire from 2017, and to achieve the environmental targets set for 2020, we need to decide on the future fuel mix for electricity generation in a timely manner. To this end, the Administration launched a public consultation on 19 March 2014 to consult the public on this important matter of profound impact on the long-term development of the electricity market.

Energy policy objectives

3. Hong Kong does not have any indigenous resources for electricity generation and has been meeting its electricity demand through importing fuel for local electricity generation or importing electricity from the Mainland. The Government's energy policy is to ensure that the energy needs of the community are met safely, reliably, efficiently and at reasonable prices, while minimising the environmental impact of electricity generation. While each one of them is important on its own, the real challenge is to strike a balance among these competing policy objectives.

Current fuel mix

4. In 2012, coal dominated the overall fuel mix in Hong Kong (53%), followed by nuclear electricity imported from the Daya Bay Nuclear Power

Station (DBNPS) in the Mainland (23%), natural gas (22%), and oil and renewable energy (RE) (2%).

Reasons for the review

5. There is an imminent need to review and plan ahead the future fuel mix for electricity generation, for the following reasons -

(a) replacing local generating units: majority of the existing local coal-fired generating units came into operation in the 1980s and are scheduled to retire from 2017. As it takes considerable time to plan, design and construct new and cleaner generation facilities or to put in place cross-boundary transmission infrastructure to import electricity from the Mainland, we need to plan ahead at an early stage;

(b) meeting projected demand for electricity: based on the latest trend of an average growth rate of about 1%-2% per annum, we estimate that total electricity consumption will increase from about 43 billion kilowatt hour (kWh) in 2012 to about 48 billion kWh in 2020 and about 50 billion kWh in 2023. We also assume that maximum electricity demand[1] would increase at about the same rate;

(c) improving air quality: the Government announced in November 2012 the targets to reduce emission of air pollutants in Hong Kong including sulphur dioxide, nitrogen oxides and respirable suspended particulates by 15%-75% by 2020 when compared to 2010. As electricity generation is a major source of air pollutant emission, improving the fuel mix for electricity generation is a major measure to achieve the 2020 reduction targets; and

(d) combating climate change: the Government proposed in a consultation exercise in 2010 to reduce carbon intensity in Hong Kong by 50%-60% by 2020 as compared to 2005[2]. We remain committed to achieving this target and as electricity generation accounts for about 66% of our carbon emission, improving the

[1] Maximum electricity demand is the highest electricity requirement in a year for a supply area and an important parameter for assessing the adequacy of generation facilities and the need for new facilities.

[2] As a non-Annex I Party under the Kyoto Protocol, China (including Hong Kong) is not required to meet any mandatory greenhouse gas (GHG) emission limits or reduction targets. This notwithstanding, the Central People's Government announced in November 2009 a voluntary national target to reduce its carbon intensity by 40% - 45% by 2020 as compared with the 2005 level. Hong Kong proposed in 2010 a higher target for itself in combating climate change with regard to its state of economic development. Carbon intensity is the amount of GHG or carbon emission per unit of gross domestic product.

fuel mix is an important mitigation measure in combating climate change[3].

Planning horizon

6. Electricity supply requires long-term planning. For instance, it will take about four to five years to build new gas-fired electricity generating units in Hong Kong, and about eight to ten years to put in place new cross-boundary transmission infrastructure. We are therefore working on the assumption that any significant change in the fuel mix can only be materialized in around 2023, i.e. about a decade from now. The preferred fuel mix option will provide us with a basis to plan for our electricity infrastructure in the next decade. With a decision to be made in 2014 and depending on the fuel mix option we finally opt for, some of the infrastructure required could only be fully completed in around 2023. Under both options, appropriate measures will be adopted to achieve the pledged environmental targets in respect of air pollutant emission and carbon intensity reduction for 2020.

Fuel mix options

7. While the actual deployment of fuel types would depend on a number of factors, as a basis for planning necessary infrastructure and with a planning horizon of about a decade from now, we have proposed the following two fuel mix options for public consultation -

(a) **Option 1: Importing more electricity through purchase from the Mainland power grid**

A possible fuel mix ratio under this option is that Hong Kong would import electricity to meet about 50% of our demand, with about 20% being nuclear electricity currently imported from DBNPS and about 30% being new purchase from the Mainland power grid (i.e. China Southern Power Grid Co. Limited (CSG))[4]; while natural gas for local generation would account for about 40%, and coal and RE the remaining about 10%; and

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[3] Apart from revamping the fuel mix on the supply side, we would separately take stock of the progress taken since the climate change public consultation in 2010 in implementing other mitigation measures on the demand side as well as adaptation measures. The updated position would provide a better basis for us to articulate in a comprehensive manner the path forward in combating climate change.

[4] CSG is a state-owned enterprise established in 2002 and invests, constructs and operates power networks in Guangdong, Guangxi, Yunnan, Guizhou and Hainan provinces and regions, serving an area of up to 1 million square kilometers and a population of about 230 million. Its generation in 2012 stood at about 825 billion kWh and the total installed capacity was about 202 000 MW, of which non-fossil fuels accounted for about 44%, and fossil fuels about 56%. The generation fuel mix was about 62% thermal, 31% hydro, 6% nuclear and 1% wind.

(b) **Option 2: Using more natural gas for local generation**
A possible fuel mix ratio under this option is to increase the share of natural gas to about 60%, and to keep that for coal and RE within about 20% while continuing with import of nuclear electricity from DBNPS for about 20% of the overall fuel mix.

8. The major difference between the above two fuel mix options is the respective role between imported electricity vis-à-vis local generation by natural gas under each option. The existing fuel mix ratio and possible ratios under the two proposed options are set out in **Annex B**.

Comparison of the two options

Energy policy objectives

9. The consultation document provides an analysis of the two fuel mix options against the energy policy objectives of safety, reliability, affordability and environmental protection as well as some other major considerations such as their implications for the post-2018 electricity market, diversification, flexibility in scaling up future supply, etc.

10. In terms of the four energy policy objectives, there is no major difference between the two options as far as **safety** is concerned. On **reliability**, local gas generation has a proven track record of strong and steady performance. While large-scale grid purchase is untested in Hong Kong, reliability of supply is expected to be secured through technical solutions, commercial contracts between the supplier and purchaser of electricity and commitments at government level. Hong Kong should be able to benefit from the strong support provided by CSG's entire power grid with multiple sources of supply. We can also retain local back-up generating capacity to cater for emergency.

11. On **affordability**, regardless of the option to be taken, it is certain that electricity will cost more than what we are currently paying as we are reducing our reliance on less expensive but more polluting coal. Either option involves substantial capital investment in new transmission or generation facilities. The rising trend has been set by the scheduled retirement of existing generation units, the decision to use more natural gas for electricity generation for better environmental performance and the expiry of the current natural gas contracts of lower price entered into some years ago. Our preliminary estimate is that the unit import/generation costs under both options will roughly double the unit generation cost over the five years from 2008 to 2012. As the price differential between the two options is not substantial, cost should not be a major consideration in assessing the two proposed fuel mix options. However, heavy reliance on natural gas under the option of local generation will increase the susceptibility of tariffs to price volatility of natural gas.

12. On **environmental performance**, under both options, we will implement measures to achieve the pledged environmental targets in respect of air pollutant emission and carbon intensity reduction for 2020 The import option would have a better local environmental performance in that it will help us achieve the upper bound of the air pollutant emission reduction target and help reduce carbon intensity by about 60% when compared to 2005, when the cross-boundary transmission infrastructure is fully completed in around 2023. By comparison, under the local generation option, barring major technological advancement, the prospect of any further significant improvement in environmental performance brought by the new generation facilities may be rather limited over their expected lifespan of about 30 years after commissioning.

Other considerations

13. Other than the four energy policy objectives, the proposed options may also be evaluated against some other relevant considerations with longer-term implications for Hong Kong's electricity landscape.

Diversification

14. Among the two options, grid purchase allows us to tap into various types of cleaner fuels which would otherwise not be available to Hong Kong, such as hydro power. As the Mainland is set to increase the use of non-fossil fuels, Hong Kong would stand to benefit from a greener and more diversified fuel mix. Local gas generation, on the other hand, will increase the risk of heavy reliance on a particular fuel type.

Flexibility in scaling up future supply

15. As compared to local generation, grid purchase offers a more viable and sustainable option in the longer run in meeting the electricity demand of Hong Kong, as it does not require any new land sites in Hong Kong to accommodate new generation facilities. A key constraint of local generation is that there may not be the flexibility to catch up with rising demand because of possible difficulty in identifying suitable sites for building new power plants, taking into account the environmental and visual impacts that may be caused to nearby residents.

Implications for the post-2018 electricity market

16. The current SCAs with the two power companies will expire in 2018, with an option exercisable by the Government to extend them for five more years, i.e. until 2023. The future fuel mix for electricity generation will affect the mode of electricity supply in Hong Kong and, to a certain extent, the regulatory framework for the electricity market when the current SCAs expire in 2018. While the latter will be further studied and reviewed by the

Government, the preferred fuel mix option will set the scene for the review of the post-2018 regulatory framework for the electricity market. More specifically, the import option will involve the construction of new cross-boundary transmission network. This may enhance interconnection between the two local power grids, and hence provide more room to introduce competition at the generation level, although the detailed mode of operation between new and existing players and related issues, e.g. third-party access to the transmission network of the two existing power companies, will need to be further studied in the post-2018 market regulatory framework review.

17. On the other hand, more new gas generating units will need to be built if we choose to rely more on local generation by natural gas. The extent to which new suppliers may take part in local generation is affected by the availability of land for any new generation facilities, the opportunity cost foregone and, perhaps more importantly, social acceptability. Allowing existing power companies to construct new generating units, however, may add to the potential stranded costs that consumers will have to bear if we are to open up the electricity market in future. There will be more constraints in introducing competition to the electricity market if we decide to go for this fuel mix option.

The Government's open position

18. The Government adopts an open position on the two fuel mix options put forward for public consultation as each of the two proposed options has its pros and cons and both could meet our energy policy objectives.

Public Consultation

19. Given the profound impact of the future fuel mix on the long-term development of electricity provision, we launched a 3-month public consultation from 19 March to 18 June 2014 to gauge public views. In particular, we would engage different stakeholder groups, including the academia, green groups, professional bodies and the business community to solicit their opinions.

Advice sought

20. Members are invited to provide comments on the future fuel mix options for electricity generation set out in the consultation document.

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Environment Bureau