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Legislative Council

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Panel on Economic Development
Meeting on 28 April 2014

Background brief on
Future Fuel Mix for Electricity Generation

Purpose

This paper provides background on the Administration's latest proposal on the future fuel mix for electricity generation and summarizes Members' relevant views and concern in previous discussions.

Background

2. 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. 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%).

3. In 2008, the Environmental Protection Department commissioned a consultancy study to review and update the local inventories of greenhouse gas ("GHG") emissions and removals, assess the impacts of climate change in Hong Kong, recommend long-term strategies and measures to reduce GHG emissions, as well as adapt to climate change.

Caps on emission from electricity generation

4. Electricity generation is a major source of air pollutant emission. From November 2008 to October 2012, three technical memoranda were gazetted for tightening the emission caps for sulphur dioxide, nitrogen oxides and respirable suspended particulates among local power plants over time, with the first technical memorandum gazetted in 2008 specifying the emission allowances for the emission years from 2010, the second technical memorandum gazetted in 2010 specifying the revised emission allowances for the emission year from 2015, and the third technical memorandum gazetted in 2012 specifying the revised allowances for the emission years from 2017. In other words, the two power companies are required to increasingly reduce emissions under those technical memoranda starting from 2010.

5. In order to meet the emission caps, the electricity companies have applied advanced technology to reduce emissions. They added flue gas desulphurization and nitrogen oxides control equipment in recent years. They are also using low emission coals whenever possible. Further emissions reduction can be achieved by changing the fuel mix on the supply side, as well as enhancing energy efficiency and conservation on the demand side. Changing the fuel mix for power generation means the reduction in coal burning, increase in the use of natural gas or switching to nuclear energy.

Climate Change Strategy and Action Agenda

6. On 10 September 2010, the Administration released the consultation document on Hong Kong's Climate Change Strategy and Action Agenda, which presented the proposals drawn up from the consultancy study in 2008. The consultation paper set out a specific target for reducing Hong Kong's carbon intensity and charting the way for a low-carbon city. The strategy and the respective action agenda for mitigating GHG included, inter alia, revamping the fuel mix for electricity generation. In gist, the Administration proposed that by 2020, coal would account for no more than 10% of the fuel mix, natural gas to account for around 40%, renewable energy to make up about 3% – 4% and the balance of about 50% would be met by imported nuclear power.

7. Following the Fukishima incident in March 2011, various countries, including the Mainland, have been reviewing the safe use of nuclear power. The Administration had to review anew Hong Kong's future fuel mix, taking

into account the development in the international arena and views of the local community, while serving to strike a balance among its four energy policy objectives of reliability, affordability, safety and environmental protection.

Proposal for future fuel mix

8. The Administration has recently finished its review on the future fuel mix which will serve as a basis for planning necessary infrastructure with a planning horizon of about a decade from now. The Administration has proposed the following two fuel mix options –

(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); while natural gas for local generation would account for about 40%, and coal and RE the remaining about 10%; and

(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.

9. 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 the table below –

<table>
<tr><th colspan="2" rowspan="2">Fuel Mix</th><th colspan="2">Import</th><th rowspan="2">Natural gas</th><th rowspan="2">Coal (&RE)</th></tr>
<tr><th>Nuclear (DBNPS)</th><th>Grid purchase</th></tr>
<tr><td colspan="2">Existing [2012]</td><td>23%</td><td>-</td><td>22%</td><td>55%*</td></tr>
<tr><td rowspan="2">Option 1</td><td rowspan="2">Importing more electricity through purchase from the Mainland power grid</td><td>20%</td><td>30%</td><td rowspan="2">40%</td><td rowspan="2">10%</td></tr>
<tr><td colspan="2">50%</td></tr>
<tr><td>Option 2</td><td>Using more natural gas for local generation</td><td>20%</td><td>-</td><td>60%</td><td>20%</td></tr>
</table>

* Inclusive of a small percentage of oil.

The above fuel mix ratios aim at providing a basis for planning the necessary infrastructure for electricity supply. Flexibility should apply to actual deployment of each fuel type, having regard to the circumstances happening on the ground.

10. The Administration has launched a three-month public consultation from 19 March to 18 June 2014 to gauge public views on its latest proposal on the future fuel mix. Details of the Administration's consultation document on the future fuel mix can be found in LC Paper No. CB(1)1117/13-14(01).

Previous discussions of Members

11. To change the fuel mix for power generation would unavoidably involve important and complicated issues such as future development of local power sector, security of energy supply and electricity tariff. Members have expressed concerns about the impact of change in fuel mix on various occasions, including the meetings of the Panel on Economic Development ("EDEV Panel") when it discussed the annual electricity tariff reviews, as

well as meetings of the Panel on Environmental Affairs ("EA Panel") when it discussed "Hong Kong's Climate Change Strategy and Action Agenda" in October 2010. These views and concerns are summarized in the ensuing paragraphs.

Need for a policy on fuel mix

12. Members of EDEV Panel in general opined that the Government should have a clear policy on the energy mix for electricity generation so that the power companies did not have to make significant investments in facilities to reduce pollution caused by using coal in generating electricity which led to large increase in tariffs.

Additional nuclear import

13. When the EDEV Panel discussed the increase in electricity tariff for 2014, members noted that CLP Power Hong Kong Ltd ("CLP") was facing pressure in fuel cost because of the higher price for the gas supplied via the Second West-East Pipeline relative to that of the fast-depleting existing supplies from Yacheng gas fields and its need to consume more gas for generating power to meet the tightened air pollutant emission caps from 2015 onwards. In view of the increase in the price of natural gas, some members opined that consideration should be given to increasing the use of nuclear energy for generating electricity. They enquired about the feasibility of increasing supply of nuclear power from DBNPS.

14. According to CLP, it had reached an agreement with Daya Bay Nuclear Power Station to import an additional 10% of nuclear power. The additional import would not require additional investment in new infrastructure nor would it increase safety risks. The agreement for importing 70% of the electricity output of DBNPS would expire in 2034.

15. A member pointed out that about 70% to 80% of the electricity supply in France was generated by nuclear energy and so far no major incident broke out in France. In order not to encourage the Mainland to build more nuclear power plants near Hong Kong, consideration could be given to purchasing electricity from nuclear power plants distant from Hong Kong.

Safety concerns on nuclear power

16. When the EA Panel discussed the fuel mix proposed in 2010, some members were concerned about the safety of nuclear plants and the risk associated with the disposal of nuclear waste. As the use of nuclear power was relatively new, there was not much experience in the treatment and disposal of nuclear waste. Given the high capital costs for setting up a nuclear plant, the unit price of nuclear power imported from the Mainland might not be lower than gas-fired electricity as claimed by the Administration. These members were also concerned about the measures taken by the Government to ensure safety in the use of nuclear energy, and the mass evacuation plan in the case of a nuclear incident.

17. When the EDEV Panel discussed the causes of the electricity tariff increase and ways to ameliorate it, some members objected to any increase in the use of nuclear energy for generation of electricity. They opined that given the potential risk in using nuclear energy, reliance on nuclear energy was undesirable and the study on the wider use of nuclear energy should be discontinued. After the expiry of the existing agreement for supply of nuclear electricity from the Mainland, the use of such electricity should be reduced.

18. A member strongly opposed to the use of nuclear energy for electricity generation. He opined that it was unethical that Hong Kong bought electricity generated by nuclear energy at a relatively low price whilst people living near the nuclear plants in the Mainland had to face the risk of a nuclear incident. In his view, the power companies should refrain from purchasing electricity from the nuclear power plants in Guangdong as the arrangement was tantamount to encouraging the Mainland authorities to build more nuclear power plants.

Renewable energy and energy conservation

19. When the EA Panel discussed the fuel mix proposed in 2010, some members noted that the proposal to increase the share of nuclear energy for power generation was meant to reduce carbon emissions. They pointed out that this could be achieved by enhancing energy efficiency and conservation. They considered that with the energy savings from the implementation of voluntary and mandatory measures to improve building energy efficiency, as well as the more extensive use of RE, there might not be a need to increase the share of nuclear energy in the fuel mix.

20. The Administration pointed out that there were cost and space considerations in the development of RE. While the two local power companies were conducting feasibility studies on development of off-shore wind farms, it was worth noting that the unit generation cost for RE would likely be many times higher than that for gas-fired or coal-fired electricity. Strenuous efforts had been made to improve energy efficiency and conservation. It was expected that by 2020, major electrical equipment in all new commercial buildings would be up to 50% more energy efficient as compared with the 2005 building stock. While energy efficiency measures were able to reduce emissions, there remained a need to change the fuel mix to increase the share of cleaner fuels for power generation.

Other sources of fuel

21. Members had explored the feasibility of importing alternative sources of fuel for power generation such as shale gas. According to the response from CLP, the United States was yet able to export a large amount of shale gas before 2015. In the Mainland, the scale of development of the shale gas reserve was currently limited. Notwithstanding, CLP undertook to secure economically viable sources of shale gas when it was available.

Estimated costs of different fuel types

22. As natural gas constitutes a high proportion of the fuel mix in electricity generation, the tariff rates would be sensitive to price fluctuation of natural gas. Members had enquired about the supply of natural gas in the coming years and the likely impact on electricity tariff. The Administration and the power companies expressed the difficulty in making estimation of the impact of the highly volatile fuel prices on electricity tariff. Their view was that changes in electricity tariff would depend on factors other than the prices of natural gas, including the amount of electricity consumption, investments in electricity facilities, etc.

23. Members had sought for information on the projected increase in fuel costs of the two power companies on the basis that electricity was generated by a hypothetical fuel mix ratio of, say, 50%, 40% and 10% for nuclear energy, natural gas and coal respectively. However, the Administration held that it was difficult to estimate the costs of further nuclear imports versus coal and natural gas prices beyond 2020. Assuming additional import of nuclear electricity was possible from Guangdong, the price would be affected by the location of the nuclear plant, the distance and mode of transmission network (overhead line by towers on land or submarine cable), security and reliability

requirement, etc. and hence the cost of investment in transmission infrastructure. The unit purchase price of the additional nuclear import, as well as possible load management and wheeling fee, was also yet to be determined. Moreover, the price of coal and natural gas would be subject to international market fluctuation, not to mention the possible infrastructural requirements to support additional gas supply. As such, the Administration considered it impossible to work out any meaningful estimates on future fuel cost against this background.

Council questions

24. Hon LEUNG Yiu-chung and Dr Hon Elizabeth Quat each raised a Council question regarding the Government's energy policy and the progress of its review of fuel mix on 19 June 2013 and 27 November 2013 respectively. The relevant hyperlinks can be found in **Appendix**.

Latest development

25. The Administration will consult the views of the EDEV Panel on the future fuel mix for electricity generation at the meeting on 28 April 2014. Members of the EA Panel have also been invited to the meeting.

References

26. A list of the relevant papers is in **Appendix**.

Council Business Division 1
Legislative Council Secretariat
24 April 2014

Appendix

List of relevant papers

The Administration's paper on Public Consultation on Future Fuel Mix for Electricity Generation (LC Paper No. CB(1)1117/13-14(01))
http://www.legco.gov.hk/yr13-14/english/panels/edev/papers/edevcb1-1117-1-e.pdf

Updated background brief on Hong Kong's Climate Change Strategy and Action Agenda for the special meeting of the Panel on Environmental Affairs on 29 April 2011 (LC Paper No. CB(1)2022/10-11(15))
http://www.legco.gov.hk/yr10-11/english/panels/ea/papers/ea0429cb1-2022-15-e.pdf

Background brief on 2014-2018 Development Plans and 2014 Annual Tariff Reviews of the two power companies for the meeting of the Panel on Economic Development on 10 December 2013 (LC Paper No. CB(1)454/13-14(07))
http://www.legco.gov.hk/yr13-14/english/panels/edev/papers/edev1210cb1-454-7-e.pdf

A Clean Air Plan for Hong Kong
http://www.enb.gov.hk/sites/default/files/New_Air_Plan_en.pdf

Minutes of meetings of the Panel on Environmental Affairs –

Date of meeting	LC Paper No.	Hyperlink
22 October 2010	CB(1)644/10-11	http://www.legco.gov.hk/yr10-11/english/panels/ea/minutes/ea20101022.pdf
25 October 2010	LC Paper No. CB(1)780/10-11	http://www.legco.gov.hk/yr10-11/english/panels/ea/minutes/ea20101025.pdf
29 April 2011	LC Paper No. CB(1)251/11-12	http://www.legco.gov.hk/yr10-11/english/panels/ea/minutes/ea20110429.pdf

Minutes of meetings of the Panel on Economic Development –

Date of meeting	LC Paper No.	Hyperlink
26 November 2012	CB(1)418/12-13	http://www.legco.gov.hk/yr12-13/english/panels/edev/minutes/edev20121126.pdf
11 December 2012	CB(1)540/12-13	http://www.legco.gov.hk/yr12-13/english/panels/edev/minutes/edev20121211.pdf
25 November 2013	CB(1)752/13-14	http://www.legco.gov.hk/yr13-14/english/panels/edev/minutes/edev20131125.pdf

Hyperlinks to relevant Council Questions –

Date	Council Question
19 June 2013	Question raised by Hon LEUNG Yiu-chung on energy policy http://www.info.gov.hk/gia/general/201306/19/P201306190340.htm
27 November 2013	Question raised by Dr Hon Elizabeth QUAT on energy policy http://www.info.gov.hk/gia/general/201311/27/P201311270492.htm