

Commissioning Schedule of the
Tseung Kwan On Substation

Research and Library Services Division
Legislative Council Secretariat
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Purpose

At the request of the LegCo Panels on Environmental Affairs and Health Services, the Research and Library Services (R&LS) Division of the Legislative Council Secretariat carried out a study on the urgency of supplying electricity to the East Kowloon/Tseung Kwan O area by the new Tseung Kwan O Substation. A research paper (RP02/95-96) was prepared and presented to the Panels in December 1995. The paper points out that according to proposals made by the China Light & Power Company, Limited (CLP) in 1992, the Tseung Kwan O Substation was scheduled to be commissioned by 1996 when the projected demand for electricity in the area would increase to 1200MVA. As the latest forecast shows that the demand for 1996 would be 17% lower than expected in 1992, there does not appear to be a need to adhere strictly to the original commissioning schedule.

2. Based on technical reasons, CLP maintains that the new substation has to be commissioned before the summer of 1996. The technical information given however differs from that given in its 1992 proposal. CLP later provided to Members a report by its consultant, Ontario Hydro International Incorporated. The consultants believe that "the most effective and practical solution to ensure continued security of supply to the East Kowloon area is to proceed with the commissioning of the Tseung Kwan O Substation and the associated Tze Wan Shan to Tseung Kwan O 400kV transmission line in early 1996, as originally scheduled."

3. As pointed out in R&LS Division's research paper RP07/95-96, the consultancy report does not address a number of important issues and its description of the grouping of the transformers at Tze Wan Shan Substation, which determines the capacity of the substation, is different from those given by CLP earlier.

4. Meetings were recently held with CLP, Ontario Hydro and the Administration to clarify the differences. This paper aims to consolidate all information available to the R&LS Division.

Background

5. The construction of a new Tseung Kwan O Substation and a transmission line linking this substation and the Tsz Wan Shan Substation is part of the Black Point 400 kV Transmission System proposed by CLP in the early 1990's.

6. The purpose of building the substation and the associated transmission link is to ensure the security of power supply to East Kowloon including Tseung Kwan O. This area has a population of 1.06 million, which is projected to increase to 1.08 million and 1.12 million by 1997 and 1998 respectively.

The Need for the Tseung Kwan O Substation and the Associated Link

7. The electricity demand of the East Kowloon / Tseung Kwan O area has always been served by the Tsz Wan Shan 400 kV Substation. According to projections made by CLP in 1992, the peak demand of this area would be some 1000 MVA by 1994 and over 1200 MVA by 1996.

8. Whilst CLP adopts a planning criterion of 1000 MVA for constructing new 400 kV substations¹, it recommended in 1992 that a new 400 kV Substation at Tseung Kwan O and a link from Tsz Wan Shan to Tseung Kwan O be commissioned in 1996, when the demand would have increased to over 1200 MVA².

Present Situation

9. Peak demand figures available now show that the forecasts made in 1992 are on the high side. The latest figures for 1995 and 1996 are around 17% below those envisaged in 1992 when the new substation and the link were proposed.

Peak Demand (in MVA) in East Kowloon/Tseung Kwan O					
	1993	1994	1995	1996	1997
Demand envisaged in 1992	974	1070	1191	1272	NA
Actual demand and latest forecasts	912	948	995	1052	1148
Deviation from 1992 forecast	-6.4%	-11.4%	-16.5%	-17.3%	NA

Source: China Light & Power Company, Limited

NA: Not available

10. Although the projected demand for 1996 is now revised downward drastically to 1052 MVA (only 83% of the forecast made in 1992), CLP still believes that the new Tseung Kwan O Substation needs to be put in service in 1996. It is of the view that the Tsz Wan Shan Substation can cope with a demand not exceeding 1000 MVA. Its view is supported by Ontario Hydro International Incorporated which has just completed a review of CLP's standards and practices as well as its 10-year development plan at CLP's request.

¹ One of the planning criteria is that the total load to be handled by any 400 kV substation would be kept, as far as possible, below 1000 MVA.

² Tseung Kwan O 400 kV Substation Environmental and Visual Impact Assessment Final Report, October 1992 (Extract at Appendix I).

CLP's Views in 1992 and 1995/96

11. It can be noted that two different views have been given by CLP regarding the commissioning of the new Tseung Kwan O Substation. They are:-

- (1) The 1992 view - The commissioning of the Tseung Kwan O Substation can wait until 1996 although the demand of East Kowloon / Tseung Kwan O would have reached 1200 MVA (thus exceeding CLP's planning criterion of 1000 MVA) by then.**
- (2) The current view - The Tseung Kwan O Substation is required when the demand of East Kowloon / Tseung Kwan O reaches 1000 MVA.**

Reasons for the Difference

12. To explain the difference, CLP has now provided the following information:-

- (i) Demand in 1996

CLP envisaged in 1992 that the demand for East Kowloon / Tseung Kwan O would be 1200 MVA by 1996. This forecast was made in early 1992. By June the same year, events including migration of manufacturing load to China and the delay in extending the MTR to Tseung Kwan O became apparent to CLP. These events would lead to a lower demand for electricity in this area. However, the forecast was not revised and the demand of 1200 MVA for 1996 was still used in CLP's report published in October 1992.

- (ii) Capacity of Tsz Wan Shan Substation

According to CLP's information given in 1992, the total firm capacity of Tsz Wan Shan Substation should be 1200 MVA. It can therefore cope with a demand of up to 1200 MVA.

CLP now advises that the capacity is only 1000 MVA because it has subsequently been assessed that, due to its old age, the fault interrupting capacity of the 132 kV switchgear at Kai Tak Substation (one of the substations fed from Tsz Wan Shan Substation) is not as high as CLP thought in 1992.

Furthermore, while CLP's 1992 information indicates that Tsz Wan Shan Substation operates with six 240 MVA transformers, recent information indicates that only five transformers are connected; meaning that the capacity has been overstated by 240 MVA. CLP also advises that the sixth transformer has to be utilized as a spare for the whole transmission system and is therefore not always available for the Tsz Wan Shan Substation.

Examination by the Administration

13. Projections of demand for electricity made by electricity companies in support of new electricity transmission and distribution plans are examined by the Administration. Its main concern is whether the projection methodology and input assumptions are reasonable. The Black Point 400kV Transmission System proposed by CLP in 1992 was examined by a consultant hired by the Administration and the proposals were found to be reasonable. CLP's planning criteria were found to be in conformance with good engineering practice followed by the utility industry and it was accepted that the total load to be handled by any 400kV substation ought to be kept within 1000MVA as far as possible. A separate assessment on the Tseung Kwan O Substation was however not made in the consultancy report. There was therefore no comment on why the substation was scheduled for 1996, when the demand would be some 1200MVA, thus exceeding the planning criterion of 1000MVA.

14. The latest information provided by CLP, including the review findings of CLP's consultant, regarding the demand for electricity in East Kowloon/Tseung Kwan O and the capacity of the Tze Wan Shan Substation has been studied by the Administration. It is of the view that the results of the fault analysis by the consultant are in line with the expected order of magnitude. It also considers CLP's practice of having five transformers working in parallel in Tze Wan Shan Substation reasonable.

Summary

15. According to CLP's proposal made in 1992, the Tseung Kwan O Substation is necessary by 1996 based on consideration of demand forecast and the capacity of existing substation available/known at the time. The latest forecast of demand for electricity for 1996 is only 83% of the forecast made in 1992. CLP maintains that the new substation is necessary before the summer of 1996. It points out lately that the demand and capacity figures given in 1992 have been revised. The Administration has examined and endorsed CLP's 1992 plan. It also finds the latest information given by CLP to be reasonable.

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Extract from "Tseung Kwan O 400kV Substation Environmental and Visual Impact Assessment Final Report", October 1992

1.2 Justification for the Substation

The bulk of the electricity demand of the East Kowloon area from Kai Tak and Tsz Wan Shan to Tseung Kwan O is supplied from the 400kV substation in Tsz Wan Shan. From current load forecasts, the estimated loading of Tsz Wan Shan Substation would be approximately 1200MVA and 1300MVA in 1995 and 1996 respectively.

The planning criterion for establishing new 400kV substations is that the loadings of existing 400kV substations (each of which can accommodate up to six 240MVA transformers) should be restricted ultimately to around 1000MVA as far as practicable. This 1000MVA limit is set to avoid widespread loadshedding on a catastrophic loss of a 400kV substation (or the circuits feeding it), and to ensure that the subsequent restoration of supply would be within the capacities of neighbouring substations.

It can be seen from the forecasts that the loading at Tsz Wan Shan Substation exceeds the 100MAV planning criterion in 1995. The loading in 1996 also exceeds the total firm capacity of 1200MVA (i.e. the capacity of the remaining five transformers at Tsz Wan Shan should one of the six 240MVA transformers be out of service). As neighbouring 400kV substations (e.g. Tai Wan) will also be heavily loaded, relieving Tsz Wan Shan by transferring part of its load to other 400kV substations via new 132kV circuits would not only be expensive but also impractical. A new substation will, therefore, be required in 1996 to relieve the heavily loaded Tsz Wan Shan Substation. CLP proposes to build this new substation in Tseung Kwan O.