ENERGY ADVISORY COMMITTEE

TECHNICAL STUDY ON INCREASING POWER INTERCONNECTION IN HONG KONG : CONSULTANCY FINDINGS

INTRODUCTION

This paper outlines the main findings of the technical feasibility study on increasing interconnection between the two power companies commissioned by the Electrical and Mechanical Services Department (EMSD).

BACKGROUND

2. A consultancy study completed in 1999 concluded that, prima facie, there could be overall economic benefits if additional interconnection was installed between CLP Power Hong Kong Ltd. (CLPP) and Hongkong Electric Company Ltd. (HEC). To pursue further the subject, EMSD commissioned the Consultant, Mott Connell Ltd., to undertake a technical feasibility study to identify the issues involved in having additional interconnection between the two power companies.

3. The scope of the study is as follows:

(a) Assessment of the preferred size and configuration of the new interconnection;

(b) Study the feasibility and engineering aspects of the route for the new interconnection;

(c) Study the capability of the two power systems in accommodating the additional interconnection, and their need for reinforcement;

(d) Study the planning criteria for expansion of generation capacity, taking into account the new interconnection; and

(e) Study the planning criteria for expansion of the transmission systems, taking into account the new interconnection.

Items (a) and (c) are closely interrelated and form the main part of the study.

MAIN FINDINGS

Preferred Size of the New Interconnection, a feasible route and its related engineering aspect, project timing and cost estimate

4. In considering the preferred size of the new interconnection, the Consultant has taken into account a number of interrelated factors such as the optimum connection point of the new interconnector with each of the two power systems, the power flow and system constraints of the two existing power systems, the future load growth of the two power systems etc. The main findings are as follows:

(i) Two new interconnectors (500MW/275kV) connecting the Yau Ma Tei Substation in the CLPP network and a new Wan Chai Substation in the HEC network, as identified in the previous study, was a correct choice if there were no adjustment to any of the network reinforcement, projected to be necessary in the Study, for meeting natural load growth of the two respective systems;

(ii) Taking a study period up to 2020, it is anticipated that there would be an increase in power transfer between the power systems, in particular if higher levels of generation coordination are implemented, or the electricity supply market becomes more open. The Consultant recommended that the two new interconnectors should be rated at 700MW and operated at 400kV, with a new 400kV/275kV transformer building to be built in an identified site in Wan Chai, to take advantage of increased transfer capability that could be made possible by certain rescheduling and adjustment of the projected network reinforcements;

(iii) The route of the new interconnectors is recommended to be from Yau Ma Tei Substation, through the West Kowloon Reclamation, then across the Harbour under the seabed, and landing in the Central-Wan Chai reclamation area. They will then go into the new transformer building and along the Harbour Road to the new Wan Chai Substation in the designated location. The Consultant has consulted the relevant departments, and based on their

feedback, concluded that the engineering issues raised by the interested parties would be solvable;

(iv) The Consultant estimated that the overall time scale of the project is around 60 months, with 12 months on project planning, 24 months on design and tender, and 24 months on site work;

(v) The earliest commencement date for the site work would be tied in with the Central-Wan Chai Reclamation project; and

(vi) The overall cost estimate at 2002 price level for the two recommended 700MW interconnectors together with the associated transformers and switchgears would be around $1.6b.

Capabilities of the power systems in accommodating additional interconnection and the need for reinforcement

5. Using the recommendation of two 700MW new interconnectors and those network reinforcements required to cater for natural load growth as a base case, the Consultant has developed four further options to test which one would be the best to suit the situations in 2010, 2015 and 2020. The findings are:

(i) The recommended option is to use the two new 700MW/ 400kV interconnectors, keeping the three existing interconnectors open circuited and only to be used as emergency standby, and advancing a number of reinforcements in the CLPP network and the HEC network. The resultant configuration would enable the greatest degree of bilateral transfer of power in the most cost-effective manner between HEC and CLPP over the period up to 2020; and

(ii) The net increase in cost over the base case for advancing the network reinforcements works at 2002 price level would be around $0.5b.

Planning criteria for expansion of generation capacity, taking into account the new interconnection

6. With regard to the study on the planning criteria for expansion of generation capacity under the current situation and under the situation with the new interconnector, the Consultant has made the following observations:

(i) The current primary planning criteria for generation planning of the two power companies have already taken into account the emergency support provided by the existing interconnector. There is already a limited degree of coordinated planning between the two power companies. The secondary criteria of the two power companies are still based on their individual operational contingencies whilst taking into account the sharing of spinning reserve made possible by the existing interconnector;

(ii) Taking into account the support of the interconnector between CLPP and HEC, and also taking into account the additional support to CLPP through its existing interconnections with the power system in South China, the Consultant concluded that, according to their respective primary planning criteria, the loss of load probability in both the CLPP network and the HEC network is on par with international best practice;

(iii) With increased interconnection and more coordinated planning, the different planning criteria of the two power companies could be harmonized, resulting in some benefits arising from increased sharing of reserves; and

(iv) Joint planning and joint dispatch would technically give greater benefits than coordinated planning. However, this would involve changes in the current structure of the electricity supply sector.

Planning criteria for expansion of the transmission systems, taking into account the new interconnection.

7. With regard to the study on the planning criteria of the transmission systems in the two power companies, the Consultant made the following observations:

(i) The present transmission planning criteria adopted by the two power companies are only adequate for the present level of interconnection via the three existing interconnectors;

(ii) With the proposed increase in interconnection, the criteria for transmission planning need to be reviewed, harmonized, and over time changed to encourage the two power companies to plan their transmission network with improved coordination; and

(iii) If different power systems are strongly interconnected, but not in common ownership nor in common operation, it would be necessary for some rules and regulations such as a Grid Code to be established.

EMSD's OBSERVATIONS/COMMENTS ON CONSULTANTS' FINDINGS

8. In the course of managing the consultancy study, EMSD held eleven steering group meetings to give guidance to the Consultant and monitor their progress. A number of working group meetings were also conducted throughout the study to examine details of particular areas and the findings. The Consultant's approach, assumptions, and interim assessment results were thoroughly examined thus ensuring all technical issues were properly addressed; and the Consultant's worldwide experience on power system interconnection has been appropriately applied in relation to the situation in Hong Kong.

9. The Consultant's findings in the area of planning criteria confirm that increase in interconnection could facilitate better resource sharing and further improves the security and reliability of the power systems in Hong Kong. However, greater degree of coordination and cooperation between the two power companies is a prerequisite.

WAY FORWARD

10. The Study proposes a technically feasible size and route for increasing interconnection between the two power companies with estimated costs and other relevant engineering issues. EMSD will further consider implementation from a technical perspective.

11. Increasing interconnection has implications going beyond technical aspects, which must also be addressed before taking forward any proposals. These wider issues include legal and funding arrangements, possible tariff impact and liability implications.

12. Given the complexity of all these issues and their paramount importance to Hong Kong, Government will consider the wider issues in the context of the overall electricity market review on the post-2008 regime in Hong Kong. Stakeholders, interested parties and the community will be consulted as appropriate.

ADVICE SOUGHT

13. Members are invited to give their views on the consultancy findings of the technical study.

Electrical and Mechanical Services Department
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