ENERGY ADVISORY COMMITTEE

Electricity Market Review:
Obligation to Serve and Source of Supply

The Issue

To review the range of practices in assigning the obligation to serve and in utilizing alternative electricity supply sources, and consider options for the development of the electricity market in Hong Kong.

Background

2. Reliable supply of electricity depends to a great extent on having a clear understanding of which entity holds the **obligation to serve** customers and therefore has the authority to access and deploy available **sources of supply**. **Obligation to serve** means the ultimate responsibility to provide electricity to the consumers under all circumstances. **Source of supply** means all possible sources of electric energy that can be deployed to meet market demand.

Obligation to Serve

3. Traditionally, vertically integrated entities operating under a regulated environment would hold the obligation to serve their captive customers. This **obligation** would include: **planning** and **building** generation and network facilities, **connecting** sources to customer loads and **supplying** electricity to all customers. Holding this obligation, the entity has the right to earn a rate of return as negotiated with the regulatory authority. Following electricity market reforms in overseas countries, many vertically integrated entities have been unbundled into separate generation, transmission, distribution and retail entities. As a result, the concept of obligation to serve has changed.

(I) Overseas Practices

4. Hitherto, electricity supply in many economies (including most developed economies) was managed by the government with the infrastructures also owned by the government. A number of overseas countries have since reformed, corporatised or privatised their electricity markets and introduced competition. Arising from the reform, the obligation to serve has been segregated and assigned to various entities (see Annex I for detail).

5. For some economies, competition is introduced to the generation sector only. For others, competition has been introduced in the generation as well as the purchase sectors (at the wholesale and/or retail levels). The various components of obligation to serve have in the circumstance been segregated into -

(a) the **obligation to build generation,** which becomes irrelevant as generation development is driven by market force and determined by investors' business objectives and strategies;

(b) the **obligation to plan generation,** which becomes an assessment exercise and is generally assigned to the network owner or a separate entity serving as the planning agent. Forecast resource adequacy signals are then provided to enable market participants to plan their investments to meet future needs;

(c) the **obligation to build transmission and distribution** facilities and **connect** supply sources to customer loads, which continues to rest with the network owners[1];

(d) the **obligation to supply** to meet market demand, which is assigned to a market agent, that could be the network owner or an Independent System Operator (ISO). This agent will arrange for sufficient resource to meet forecast load demand, and dispatch available generation and network resource to maintain a supply/demand balance having due regard to network stability; and

(e) the **obligation to deliver** to consumers, which rests with the distribution entity that provides backup electricity supply in the event that a retailer fails to deliver the contracted amount to the consumers.

[1] In some markets, a network company may own both transmission and distribution assets. In others, the two sets of asset may be owned by different companies.

(II) Hong Kong Practice

6. In Hong Kong, the CLP Power and the HEC are vertically integrated utilities, which own and operate their respective generation, transmission and distribution assets. The two power companies have assumed all obligations to serve customers in their respective supply areas.

(III) Possible Options

(A) Vertical Integration: Status Quo

7. The current market structure and the two power companies' vertically integrated organizations have provided safe and reliable electricity supply to consumers in Hong Kong, as demonstrated by their high performance index (>99.99%) and in a way ensured operational efficiency. Vertical integration also enables corporate decisions to committing investments on various infrastructures to be made in accordance with the overall business objectives. However, there has been criticism that retaining this mode of vertically integrated operation and their respective supply areas could inhibit changes to the Hong Kong electricity market to enhance market efficiency that may result in lower electricity tariff.

(B) Obligation Segregation: competition at various levels

8. The obligation to serve could be partially or totally segregated leading to competition in (a) the generation sector, (b) the generation and purchase sectors at the wholesale level, or (c) both generation and purchase sectors at both the wholesale and retail levels.

(a) Competition in Generation Sector

Under this scenario, the obligation to build generation will become irrelevant as this will be driven by market forces. A Planning Agent will assume the obligation to plan for future generation needs and anyone can build generators and offer electric power to supply the aggregated loads. Incumbent power companies may be mandated to separate their generation and network functions to

facilitate fair competition in the generation sector, and offer third party access to their networks. The network functions of the power companies, nonetheless, retain the remaining obligations, viz. to plan and build transmission and distribution network, connect sources to customer loads, supply to meet market demand (can be assigned to a market agent) and deliver electricity to consumers.

This options would -

(i) Promote multiple generation investors;

(ii) induce and hopefully achieve near optimal use of generation resource to meet market need, and

(iii) induce lowering of tariff.

As a corollary, this approach could also give rise to -

(iv) confusions because of the multiple segregations of obligation;

(v) potential disputes and the corresponding resolution process;

(vi) introduction of additional players (planning agent and market agent) hence extra costs and additional administrative chores; and

(vii) mandated separation of functions for power companies, possibly perception of or real active interference into private business operation and legal challenges.

(b) Wholesale Competition in Generation and Purchase Sectors at the Wholesale Level

Under this scenario, there would be multiple wholesale purchasers leading to competitive bidding to purchase electricity, thereby adding further pressure to reduce tariff. This scenario also envisages the segregation of obligation to plan and build networks. Network planning will be performed by a Planning Agent whereas

the obligation to build network facilities would rest with the network function of the power companies. The obligation to supply will be assigned to a Market Agent (which can be the network owner) to manage the supply/purchase bids and dispatch generation and network resources to maintain supply/demand balance and network stability. Moreover, some wholesale purchasers may own distribution networks, the obligation to deliver electricity to the consumers would rest with the distribution entities (which may or may not be owned by a transmission network company).

With the appearance of multiple sellers and buyers, this option facilitates more competitive pricing, determined by supply and demand, and enhances market efficiency at the wholesale level. In the same vein, additional purchasers would give rise to even more administrative burden and further legal complications with the coming of multiple wholesale purchasers.

(c) Competition in all Sectors at the Wholesale and Retail Levels

Under this scenario, all obligations formerly rest with the vertically integrated power companies are completely segregated. Any customers can purchase electricity from any generators or entities that offer to make such arrangements on their behalf. This scenario further increases the number of buyers and sellers to facilitate more competition to reduce tariff. Arising simultaneously are more complexity in the management of the market which could lead to instability, more confusion to market participants and consumers and much increased administrative burden.

9. Segregation of the obligation to serve, in whichever sector at whatever level, would necessitate institutional arrangement to clearly stipulate the role, responsibility and authority of the various entities to ensure on the one hand their being able to fulfill their obligations and on the other to ensure stability and reliability in electricity supply.

Source of Supply

(I) Overseas Practices

10. Most power companies (or generating companies in liberalized markets) supply their customers from their own generation that uses traditional forms of energy including fossil (coal, oil and gas), hydro and nuclear. Depending on the local environment, some power companies develop other forms of energy source such as wind and solar energy for commercial use. Some power companies take advantage of the interconnection to purchase electricity at lower cost from other companies as an alternative source of supply.

(II) Hong Kong Practice

11. The CLP Power and the HEC supply electricity from their own or affiliated sources. The CLP Power generates electricity from the local power stations at Castle Peak, Black Point and Penny's Bay, and also imports power from the Guangdong Nuclear Power Station at Daya Bay and Guangzhou Pumped Storage Power Station at Conghua under joint venture arrangements. The HEC generates electricity from its local power station at Lamma Island.

(III) Possible Options

(A) Status Quo

12. The two power companies have been supplying power from their own and affiliated sources with increased generating units at Black Point and Lamma or other alternative sites as required. The diverse sources of supply in the case of the CLP Power, the certainty of availability of generation sources within Hong Kong and its direct control over dispatch of these resources to meet market demands have assured Hong Kong of the security and stability of supply. Land and other constraints would hamper the development of new generation facilities when such are required to support economic and social developments. At the same time, sourcing solely from local facilities also brings rigidity in capacity planning, entailing possibly certain necessary redundancy investment.

(B) Renewable Energy

13. Application of renewable energy is becoming an important topic for the purpose of sustainable development. EMSD has commissioned a study to examine the potential for wide-scale adoption of suitable renewable energy resources in Hong Kong. It will also devise a strategy to secure wider use of these sources to reduce pollutant emission arising from the use of fossil fuels in power generation and to conserve the reserves of fossil fuels. The study is still in progress[2].

14. Depending on technical viability and economic feasibility, renewable energy could be considered as an alternative source and as possible contribution to environment sustainability. However, the risks associated with the dependability of such sources, and the small amount that can be utilize for commercial use in the foreseeable future are factors which would have to be taken into account. Moreover, while special provision might be made to facilitate the introduction and promotion of renewable energy, possible distortion of the market arising as a result would have to be carefully evaluated.

(C) Supply from South China

15. The Guangdong electric power system is interconnected with that of CLP Power. The continued growth in economic activities and the high demand expected in the years ahead suggest that spare capacity will unlikely be available in South China in the foreseeable future for supply to Hong Kong. Power shortage in Guangdong during peak demand periods is not uncommon: the electricity supply situation in South China is at Annex II. Despite the perceived unavailability of spare capacity, the uncertainty in delivery and the inevitable reinforcement and adjustment to existing transmission and distribution infrastructure, the option of importing electricity even on the infrequent occasions should be further explored and hence the on-going reform of the electricity markets in Mainland China[3] should be closely monitored.

---

[2] EnAC Paper 07/2001 refers.

[3] Under the broad plan announced in April 2002, the State Power Corporation will be separated into several entities responsible for generation and network businesses. Another independent grid company will be set up for the southern provinces. Further details of the reform are yet to be worked out.

Observations

16. The obligation to serve is at once a right to supply and a liability to meet market demand. It is important to make the community aware that while increased competition with more players would theoretically lower tariff, the reality may not be up to expectation since the players might need to cushion themselves against potential "liability" in meeting demand. Moreover, in making available this "right" to everybody who is ready to supply, there could be implications on who would/could be held liable in the event of vicissitudes in demand. This is to say, the sharing of liability amongst various players could impact adversely on stability in electricity availability to consumers.

17. Similarly, sourcing of electricity from outside Hong Kong or other sources might come at a price, which could be in the form of payment for necessary infrastructure or reliability in supply, and thus would have to be carefully considered.

Advice Sought

18. Members are invited to offer views on the issues and possible approaches having regard to the situation in Hong Kong, bearing in mind that the two power companies in Hong Kong are investor-owned and overseas experience of privatisation or corporatisation is not relevant.

Economic Development and Labour Bureau
July 2002

Annex I

Overseas Experience on Obligation to Serve

In a traditional regulated environment, the vertically integrated entity would hold the obligation to serve all customers within its supply area. In fulfilling this obligation, the entity enjoys the right to earn a rate of return as endorsed by the regulatory authority.

2. As the electricity market is reformed toward open competition, as in the case of a number of developed countries, the concept of obligation to serve has changed. Various components of the traditional obligation are now taken up by different entities.

Obligation to build generation

3. In the generation sector of a competitive market, planning and development of new generation resources will be determined by market forces. In response to market signals, generation companies will develop their own investment plans according to their business strategies. Normally, an Independent System Operator (ISO) or Transmission System Operator (TSO, which could be the network owner itself) is established to assume the role of preparing long-term demand forecast thereby identifying the needs for generation resource addition. This forecast information is publicly available, and it is up to the market to respond to these opportunities and determine whether the investment options are viable. Generation owners earn a rate of return for offering electricity based on market price, or at a price determined during purchase agreement negotiation.

Obligation to build network

4. In competitive markets, the electricity network remains as a natural monopoly business. The ISO/TSO (which could be the network owner) or an independent planning agent will perform central assessment of transfer capability and identify potential constraints while the responsibility for maintaining and operating the networks still rests with the network owners. In essence, these network companies will have the obligation to build and expand the networks to provide the needed transfer capability so indicated by the ISO/TSO or the independent planning agent. The network owner has the right to earn a regulated rate of return for its investment. The ISO/TSO has the right and authority to approve or deny transmission outage requests, and direct the actual delivery of electricity. The ISO/TSO receives a fee for providing this service.

Obligation to connect

5. The network owners have the obligation to connect supply sources to customer and loads. Fair and non-discriminatory network access regimes, underpinned by legislation, are usually in place. In most cases, the legislation will outline the principles and give legal backing to the regulatory framework. Connection and access rules that stipulate the requirements and procedures for processing connection/access applications are usually published. To fulfil this obligation, the network owners usually apply a connection charge to the customers (generation and load).

Obligation to supply (for entire system)

6. The ISO/TSO is obligated to maintain real time electricity supply and demand balance, and to despatch available generation and network resources to ensure the reliable and stable operation of the entire power system. In other word, the ISO/TSO has the obligation to exercise its authority to dispatch available generation resources including external supplies and network facilities to ensure adequate electricity supply and stable delivery at the power system (market) level. It receives a fee for providing this service.

Obligation to supply (to consumers)

7. If the retail sector of the electricity supply industry is open for competition, the incumbent distribution network company would hold the obligation to ensure continued supply to the retail customers within its supply area (hence acting as the provider of last resort). This is to ensure that electricity supply to all consumers will be maintained in case any new retailers in the market should go out of the business for whatever reasons (e.g. due to competition). In some of the electricity markets in the U.S.A., the load serving entities (e.g. retailers) are required to purchase generation capacity and/or build their own generation facilities to ensure the adequacy of supply. The distribution network company earns a regulated rate of return for providing the connection, and a negotiated rate of return for arranging for backup electricity supply.

Annex II

Electricity Supply Situation in South China

The Guangdong electric power system is interconnected with the CLP Power system at 500/400 KV and 132 KV levels. In 2000, the total installed capacity in Guangdong was about 3 times of that in Hong Kong (HEC and CLP Power combined). Among the installed capacity, about one-third are oil-fired generator units of which more than half are small to medium size heavy-oil-fired units. The increase in electricity demand in Guangdong in recent years has been met mainly by import of electricity from the western provinces. In 2001, increase in oil price and long periods of dry season had led to significant reduction in the electricity output from oil-fired units and hydro power plants. As a result, supply shortage occurred in Guangdong during peak demand periods.

2. Besides high oil price and dry weather, strong demand growth and low reliability of small thermal and hydro generators have also contributed to the tight energy situation. Under the Tenth Five Year Plan (2001-2005 inclusive), Guangdong aims to phase out small generating units with a total capacity of about 2,000MW. As the demand growth is estimated to be around 7 to 8% per year, it is estimated that an additional 16,500MW of generation capacity will be required during the period of the Tenth Five Year Plan. However, the new generators under construction together with the targeted additional imports of electricity from the western provinces could only barely meet the demand growth of Guangdong in the period. Also, it is expected that the cheaper electricity imports from the western provinces will lead to reduced tariff, and this will further aggravates the demand pressure on the central grid, when many of the consumers will switch from the small and inefficient local generations to the grid supply. There are also concerns about importing of electricity from the western provinces, particularly on the supply reliability, due to the long transmission distance and the weather dependence of hydro power sources.

3. The electricity markets in the Mainland are undergoing a major reform. The Guangdong electric power system, being part of the South China Grid, will be affected by this reform but the details of which are not yet available.