



香港電燈有限公司
The Hongkong Electric Co., Ltd.



Submission on Stage I Consultation
Future Development of the
Electricity Market in Hong Kong

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1 Introduction

The Hongkong Electric Co., Ltd. (HEC) is pleased to provide this submission in response to the Government's Stage I Consultation Paper on Future Development of the Electricity Market in Hong Kong.

Since the release of the Consultation Paper in January 2005, HEC has been actively soliciting the views of its major stakeholders and carrying out extensive research on market reform in other jurisdictions. Accordingly, this submission is based on HEC's own hands-on operating experience in overseas power markets, feedback from various stakeholders, and findings from careful research.

HEC has been supplying electricity to Hong Kong Island for over 110 years, and has a demonstrated commitment to safely providing a reliable, efficient and adequate electricity supply to its customers.

HEC owns the Lamma Power Station which is located on a 50-hectare site at Po Lo Tsui at Lamma Island. This station provides electricity supply to Hong Kong Island, Ap Lei Chau and Lamma Island. In order to meet future demand for electricity on a timely basis, HEC has constructed a 22-hectare extension site to the Lamma Power Station to accommodate six additional gas-fired generating units. The first unit will be commissioned in 2006.

HEC has been operating in the Hong Kong market under the Scheme of Control Agreement (SCA) since 1979. HEC appreciates the Government's recognition of HEC's efforts and contribution to Hong Kong's development made under these arrangements.

As a key stakeholder in the Hong Kong electricity market, HEC welcomes this review and the opportunity to provide experience-based input for the future development of the market.

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2 Executive Summary

2.1 A crucial issue: reliability vs new risks

The 2008 SCA renewal presents the Government with the opportunity to review the successes of the past as well as consider new approaches that would continue to offer a reliable and economically efficient power supply for Hong Kong's future.

In an environment of continuing economic uncertainty, rising fuel prices and increasing environmental pressures, HEC recognizes that the Government and the community face a delicate task in balancing a range of often competing objectives.

However, paramount amongst these is the undisputed fact that the outstanding reliability achieved by Hong Kong's power companies over the SCA periods has been a vital contributor to Hong Kong's economic progress and prosperity. As many countries that have experimented with market reform have discovered to their detriment and chagrin, reliable power supply is very easy to take for granted but very difficult to fix once compromised.

Reliable power supply is very easy to take for granted but very difficult to fix once compromised.

2.2 HEC's approach: benefits vs risks and costs

As one of two incumbent power companies and with billions of dollars already invested in the Hong Kong power industry, HEC obviously has much at stake in the outcome of the current consultation process. HEC's shareholders and financiers therefore have more than just a legitimate interest in ensuring that the value of their existing investments is maintained and that HEC remains able to attract future funds at competitive rates.

However, HEC's shareholders and financiers ultimately share a common goal with Hong Kong's power consumers. A safe and secure power system that continues to deliver Hong Kong's exemplary reliability levels is only achievable if investors and financiers continue to have confidence in the regulatory arrangements governing the power industry.

As an investor-owned utility that has delivered world-leading levels of reliability, HEC believes that the current regime should only be amended where it can be clearly demonstrated that the benefits of the change outweigh the risks and costs.

Exemplary reliability levels are only achievable if there is confidence in the regulatory arrangements.

2.3 The Consultation Paper: a useful starting point

HEC commends the Government on its wide-ranging Consultation Paper, which provides a useful starting point for the 2008 SCA renewal process.

The Consultation Paper identifies the Government's policy objectives, which can be expressed as follows:

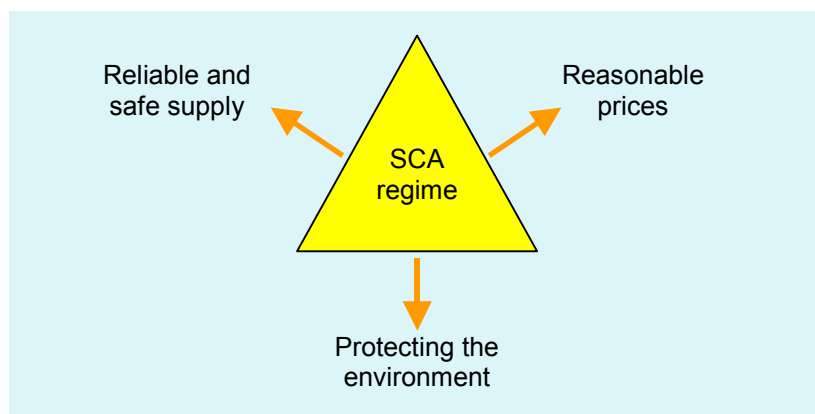


Figure 1: Government's policy objectives

In summary form, the objectives are:

- **reliable and safe supply** - reliable electricity supply is vital to the economic activity and everyday life in Hong Kong;
- **reasonable prices** - reliability must be balanced with price outcomes; and
- **protecting the environment** - minimising pollution (and improving air quality) and greenhouse gas emissions.

HEC agrees that these represent a realistic and sensible suite of policy objectives. However, as highlighted in the Consultation Paper, these objectives are sometimes in conflict. Ultimately, the most challenging issue will be the need to resolve these competing tensions.

2.4 Issues are interlinked: the virtuous circle

This submission sets out HEC's views on the issues raised in the Consultation Paper.

If the Consultation Paper is any guide, most attention will be devoted to the question of how best to achieve reliable supply at reasonable prices. It is indisputable that considerable economic benefits flow from a reliable power system. On the contrary, less attractive returns to investors in the power industry can result in economic consequences of under-investment that are very serious.

HEC sees these issues as inextricably linked in a “virtuous circle”, which can be represented as follows:

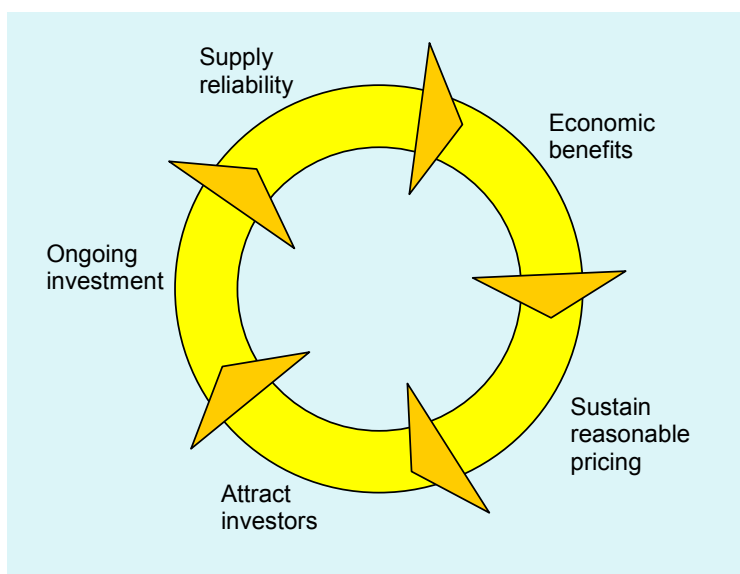


Figure 2: The virtuous circle

Importantly:

- there is no natural “starting point” in the circle - no element has priority;
- each element of the circle is dependent on all the other elements; and
- adjusting one element can have significant (and often unforeseen) effects on the other elements.

In this context, the various issues raised in the Consultation Paper can be seen as a set of interlinked issues.

2.5 Meeting the Government’s key policy objectives

Reliability

The Government notes:

“We enjoy a high level of supply reliability that currently exceeds 99.99% which is among the highest in the world...”¹

This level of reliability is necessary for advanced economies that have become increasingly dependent on a secure and adequate electricity supply.

¹ Consultation Paper, p 6.

Hong Kong has high-density and high-rise living and a heavy reliance on elevators and electrified transportation systems. According to a recent high-rise building survey² which ranks 100 international cities according to the total number of floors of their high-rise buildings, Hong Kong has been ranked first. Hong Kong is followed by New York City and Seoul as a distant second and third respectively (as shown in Figure 3). Further, because of Hong Kong's climate, there is also a high penetration of air-conditioning which is considered crucial to lifestyle and working environments. Hong Kong people are also demanding, and they expect the highest standards to be maintained at all times.

Rank	City	Population	Buildings ^a	Points ^b	Reliability ^c
1	Hong Kong	6,787,000	7,422	114,486	99.99+%
2	New York City	8,115,135	5,444	35,406	99.9992%
3	Seoul	10,331,244	2,831	15,590	99.9963%
5	Singapore	3,437,300	3,503	13,147	99.9998%
7	Tokyo	8,130,408	2,069	9,223	99.9977%
14	Sydney	4,201,500	802	4,073	99.9909%
23	London	7,172,036	1,295	2,741	99.9931%
36	Paris	2,152,467	248	1,785	99.9968%
52	Taipei	2,719,293	152	1,228	99.9991%

Notes:

a) A high-rise building is defined as a building 35 meters or greater in height, which is divided at regular intervals into occupiable levels.

b) Points per Building:

12 - 19 floors = 1 point	60 - 69 floors = 200 points
20 - 29 floors = 5 points	70 - 79 floors = 300 points
30 - 39 floors = 25 points	80 - 89 floors = 400 points
40 - 49 floors = 50 points	90 - 99 floors = 500 points
50 - 59 floors = 100 points	100+ floors = 600 points

c) 2003/04 figures from web research.

Figure 3: High-rise building survey and supply reliability of major cities, April 2005

The importance of reliable electricity to a metropolitan city cannot be emphasized enough. In fact, Hong Kong is not alone in this aspect. Manhattan Island of New York City, another metropolitan city and a leading world-class financial centre whose service territory is similar to that of Hong Kong, also warrants high supply reliability.

Although the lower planning criteria for HEC require a lower investment level than New York's, HEC has been able to maintain the same level of reliability (i.e. 99.999%) as New York's since 1997. This has been a result of good asset management skills, thorough planning, quality construction, and the regular training of operating and maintenance staff on top of timely and sensible investments.

² Emporis (April 2005), www.emporis.com.

Hong Kong people are demanding and they expect the highest standards to be maintained at all times, particularly given Hong Kong's position on this high-rise building chart.

Reasonable prices

The Consultation Paper shows³:

- in general, electricity bills account for less than 2% of the general household expenditure for residential customers;
- a recent survey indicates electricity bills constitute less than 10% of the monthly operating costs for the majority (77%) of the non-residential customers surveyed; and
- HEC's residential tariffs are in the middle range when compared to those of other major cities and only higher than those of the state-owned utilities in Singapore and Taipei.

Further, an analysis⁴ has shown that increases in HEC tariffs have been well below CPI increases since 1983, the first full operating year of Lamma Power Station (even though this has included an unusual period of deflation in Hong Kong).

HEC tariff increases have been well below CPI increases since 1983 even though this has included an unusual period of deflation in Hong Kong.

Environment

The SCA has shown itself to be a particularly efficient and effective mechanism for the Government to implement its environmental policies, and energy efficiency and conservation programmes while maintaining appropriate tariff levels.

In a deregulated regime in which competition is based on the marginal costs of generation, utilities have no incentive at all to improve the environmental facilities and performance of their generation plants.

However, under the stable operating environment created by the SCA, HEC has been making significant environmental achievements and its efforts are well-recognized.

- HEC is presently installing the first commercial scale wind turbine in Hong Kong.

³ Consultation Paper, pp 6-8.

⁴ Figure 13 in Section 5.3 of the Full Submission.

- HEC's first gas-fired generating unit is under construction and will use liquefied natural gas (LNG), which is an environmentally friendly fuel with low emissions.
- For its coal-fired units, HEC is the first power utility in the whole of Asia (except Japan) to introduce flue gas desulphurization (FGD) plant in 1993 to reduce SO₂ emissions significantly. In addition to FGD plants, HEC has also installed low-NO_x burners and electrostatic precipitators to reduce NO_x and particulates emission.

Of course, environmental objectives need to be balanced against the additional costs they impose. This is a case where there is a tension between the objectives of reasonable tariffs and emission reductions and so the caps imposed on emissions from generators must be practical and achievable at a reasonable cost.

The SCA has shown itself to be a particularly efficient and effective mechanism for the Government to implement its environmental policies.

2.6 Electricity as an imperative

Electricity is an essential service; it is not a luxury. It is a critical input into the creation and provision of all goods and services. Reliability of supply is indispensable to a modern and competitive economy and to ensuring continued economic growth.

*"Today, the use of electricity is both indispensable to modern life and an essential part of our very well being. However, it has become so pervasive that it is "transparent" to most consumers, at least until there is an outage. Were it possible to turn off our entire electric power system for a few hours, and assess the impact, the full measure of electricity's role in the economy would become evident. Few processes other than some space heating, most transportation, and agriculture would continue to function, and even then poorly, constituting a loss of about \$1 billion per hour. The entire economy would stop."*⁵

A business competitiveness survey conducted by the Chinese University of Hong Kong in 2004 indicated reliable supply is a very important consideration in deciding where to set up business and that reliability is more important than tariff levels.⁶

⁵ S. Massoud Amin and Clark W. Gellings 2005. "The North American power delivery system: balancing market restructuring and environmental economics with infrastructure security." *Energy-The International Journal*, forthcoming.

⁶ The Chinese University of Hong Kong and Lingnan University "A Report on the Survey of the Cost Competitiveness of Hong Kong Businesses" (October 2004).

Despite this, it is only when the “lights go out” that the importance of reliability is recognized. For example, the blackout in 2003 affecting the Eastern U.S. and Canada resulted in an estimated economic loss of up to US\$10 billion.⁷

It is only when the “lights go out” that the importance of reliability is recognized. The 2003 blackout across the Eastern U.S. and Canada resulted in an estimated economic loss of up to US\$10 billion.

2.7 Reliability cannot be sacrificed for lower tariffs

Ultimately, there is a trade-off between the level of reliability and the level of tariffs. HEC is of the view that the current balance between reliability and tariffs is appropriate.

To the community, each unit of electricity costs around HK\$1. However, for each unit of electricity unserved, the cost to the community from stoppages of various social and business activities is many times higher. A very conservative estimate of such cost in the U.S. is about HK\$40 per unit.⁸

This can be best illustrated by considering a hypothetical example of Hong Kong’s supply reliability declining from 99.99+% to 99.00% - that would result in a 1% probability of service interruption, or about 87 expected unserved hours per customer per year. Based on the 2004 annual reports of Hongkong Electric Holdings and CLP Holdings, Hong Kong’s average demand per hour is about 4,478 MW. The 1% reliability deterioration would cost the entire community of Hong Kong approximately HK\$15 billion per year.⁹

In trying to strike the right balance, it is imperative that the Government ensures that Hong Kong’s electricity systems are reliable. International experience has shown that the economic impacts of under-investment in electricity infrastructure flowing from returns being set too low are extremely high and costly. As such, there should be a bias towards ensuring reliability when balancing the trade-off between reliability and costs.

HEC is of the view that the current balance between reliability and tariffs is appropriate, e.g. 1% less reliability could cost Hong Kong \$15 billion per year.

⁷ U.S. - Canada Power System Outage Task Force “*Final Report on the August 14, 2003 Blackout in the United States and Canada*” (April 2004) p 1.

⁸ See Woo and Pupp (1992) for a survey of outage costs in the U.S. As a comparison, the system average outage cost of PG&E in 1992 was estimated to be US\$17 per unit of electricity unserved (Keane and Woo, 1992). The figure used by the National Grid (U.K.) in 2000 was £2.816 per unit of electricity unserved (Roques, Newbery and Nuttal, 2005, p 6).

⁹ 4,478 MW per hour x 87.6 hours unserved per year x HK\$40,000/MWh unserved is about HK\$15 billion per year.

2.8 International experience: lessons from experimentation

The last 20 years have seen extensive electricity market restructuring, deregulation and new methods of regulation. As noted by the Government in its review of other economies, electricity market reform has led to mixed outcomes.¹⁰

There are a number of lessons to be learned from the reform experience of other countries.

- Electricity is unlike any other commodity in that it cannot be stored and demand and supply must be kept in balance at all times. This means that, unlike other commodity markets, deregulated electricity markets are very complex.
- Electricity is demand inelastic but supply and demand has to be continuously and instantaneously balanced. The electricity markets are therefore particularly susceptible to abuse of market power. Indeed, it has been claimed that most wholesale electricity markets around the world are subject to the abuse of market power by large firms.¹¹
- As recognized by the Government, there is no universal model for market reform and local factors must be taken into account.¹²
- The costs of getting market reform wrong are enormous. The costs of the failed Californian market reform are more than US\$50 billion.¹³
- The impact of regulation cannot be overstated. Inappropriate regulation has led to systematic under-investment in a number of countries with consequent infrastructure failure at a huge cost to society.¹⁴
- The complexities of reformed markets mean that they propagate new regulations and regulatory staff. These institutions and arrangements are expensive to establish and maintain. The costs are generally measured in tens of millions, if not hundreds of millions, of dollars.¹⁵ Ultimately, these costs are priced into tariffs and passed through to consumers.

Of course, the negative experiences of other countries do not mean that changes or adjustments should be rejected out of hand. However, they do highlight the risks and costs involved, and Hong Kong therefore needs to act with extreme caution.

¹⁰ Consultation Paper, p 10.

¹¹ Fabra N and Harbord D, *"Market Power in Electricity Markets: An Overview of the Theoretical and Empirical Literature"* (2001).

¹² Consultation Paper, p 10.

¹³ Lave, L.B., J. Apt and S. Blumsack (2004) *"Rethinking electricity deregulation"*, Electricity Journal 17(8): p 11.

¹⁴ Refer to Appendix 1 of the Full Submission.

¹⁵ Refer to Appendix 2 of the Full Submission

Changes, if any, need to be carefully thought out and introduced incrementally. This would ensure that the Government can assess whether the anticipated benefits have actually arisen at each stage. The Government could then decide whether it should proceed further.

As part of this process, the first few steps or changes also need to be reversible. Hong Kong's power suppliers have made huge investments in long-term infrastructure and a significant cost of reform in other jurisdictions has been stranded costs related to sunk investments made on the basis of the old regime. If major changes are contemplated, these costs should be minimized or even avoided by a measured and proper transition. Further, once an inappropriate regulatory system has been introduced, it would be very difficult and costly to unravel it, and that invariably would lead to an erosion of confidence in the new arrangements by all stakeholders.

Many lessons have been learnt at enormous and unprecedented costs. Experimentation must be avoided.

2.9 Perceived problems: HEC's responses

The Government identified the following criticisms of the SCA¹⁶:

- the permitted rates of return are considered high in the present day economic climate;
- the permitted return, based on fixed assets, is perceived to have encouraged over-investment;
- the permitted rate of return fixed over a 15-year period lacks flexibility, as amendments to the SCA cannot be made without the consent of the parties involved; and
- the annual tariff and auditing reviews lack transparency.

HEC believes that these “problems” are overstated and arise from an incomplete understanding of the SCA and the environment in which electricity infrastructure providers operate. Each of these issues is considered in detail in the relevant sections of this submission but HEC's responses can be summarized as follows:

- Permitted return: All things considered, the existing permitted return has proved to be reasonable to investors, sufficient to attract investment, and has provided electricity supply at reasonable tariff, high reliability, and excellent services.

¹⁶ Consultation Paper, p 9.

- Investment level: HEC's investment in electricity infrastructure has been prudent and timely under the regulatory scrutiny of the Government. Furthermore, any over-investment would have been penalized by an excess capacity adjustment that would be deducted from the permitted return.
- SCA time-frame: As recognized by the Government, the uncertainties arising from a shorter agreement period would deter continued or longer term investment by the power companies. Given the long-term nature of investment in electricity infrastructure and the long-term take-or-pay gas supply contracts, the current 15-year regulatory period is appropriate.
- Transparency: HEC is willing to work with the Government further on increasing the transparency of the tariff setting process, subject to full confidentiality for commercially sensitive information that is passed to the regulator.

HEC believes that these “problems” are overstated and arise from an incomplete understanding of the SCA and the environment in which electricity infrastructure providers operate.

2.10 ‘Possible’ options: ‘benefits’ do not necessarily outweigh costs

The Consultation Paper suggests the following possible options:

- modifying the SCA by adopting new regulatory mechanisms;
- introducing a new regime involving one or all the options of increased interconnection, new supply sources and open grid access; and
- a new legislative framework and institutions.

HEC is concerned that many proponents for change see reform as a means to an end, namely the lowering of tariffs. Nevertheless, the costs incurred for the changes may actually be higher than the benefits, if indeed there were benefits to be derived. In fact, international experience has shown tariff reductions, even if realized, are often transitory and at the cost of poorly maintained systems which are incapable of meeting future demands. Market reform in California is a classic example where rates were mandated to fall but the ultimate cost to consumers and the State far exceeded those temporary benefits. The failure of electricity restructuring in Ontario is another well-documented example.¹⁷

The risks and benefits of each possible option are considered elsewhere in this submission. While HEC acknowledges that some of the options (if implemented properly) could give rise to benefits, HEC is of the view that these benefits do not clearly outweigh the costs or the risks that they introduce.

¹⁷ Woo, C.K., D. Lloyd, and A. Tishler. 2003. “Electricity market reform failures: UK, Norway, Alberta and California.” *Energy Policy* 31(11): 1103-1115; Trebilcock, M.J., and R. Hrab. 2005. “Electricity restructuring in Ontario,” *Energy Journal* 26(1): p 123-146.

As a general comment, each of these options introduces a greater level of complexity and will be expensive to implement and maintain. These costs will be significant and must be factored into the analysis.

The consultation debate must not be driven by ideology – that one form of industry structure or regulation is superior to another. There is no perfect model; each model has its flaws and limitations. In changing the regulatory regime, Hong Kong will simply replace one set of issues with another set - this potentially leads to a downward spiral of ever increasing regulation.

Changes, if any, should produce outcomes that are demonstrably superior to the outcomes under the existing regime.

Change must not be for the sake of change.

2.11 Specific issues raised in Consultation Paper

A summary of HEC's comments in relation to each of the specific issues raised in the Consultation Paper is set out below.

Return on investment: ROA most appropriate

HEC is of the view that the criticisms of its return under the SCA are misconceived. HEC's 13.5% return is a "nominal" return (i.e. without reference to inflation) and applies equally to generation, transmission and distribution assets. The general misconception is attributed to the 6-9% return in the U.K. and Australia quoted in the Consultation Paper.¹⁸ First of all, these rates of return are "real" rates (i.e. apply to inflation adjusted asset base). Secondly, HEC's tariff, which results from the SCA formula of cost pass-through and HEC's return, is less than the tariff charged to, for example, London consumers as tabulated in the Consultation Paper.¹⁹ The London tariff is arrived at by similar cost pass-through arrangements and a combination of a market driven return on generation assets, and an "inflation adjusted return" on transmission and distribution assets. The fact that HEC's tariff is lower than the London tariff demonstrates that HEC's return is not out of step with rates of return in other jurisdictions. Indeed, when proper comparisons are made, taking into account the difference between "nominal" and "real" returns and the market return earned on generation assets, it is evident that HEC's return is reasonable.

HEC first signed the SCA in 1979. HEC's 13.5% return under the SCA since 1979 is again proved reasonable when taking into account the actual market conditions. Over the 26-year period between 1979 and 2004, the average inflation rate is 5.8% while the average best lending rate is 9.24%.

¹⁸ Consultation Paper, p 16.

¹⁹ Consultation Paper, p 8.

One of the issues that appears to have been lost in the debate over HEC's rate of return under the SCA is that *the return is not a guaranteed return*. In fact, over recent years, HEC has substantially under-recovered the revenue needed to enable it to earn the permitted return under the SCA. A substantial proportion of this under-recovery was a result of HEC agreeing to ease the tariff pressure on consumers and to assist in the recovery of Hong Kong's economy.

HEC's tariffs are in line with tariffs in OECD (Organisation for Economic Cooperation and Development) countries and other major cities. In addition, Hong Kong consumers enjoy a higher level of reliability for their tariffs than customers in other cities.

The existing SCA has provided appropriate incentives for investment in electricity infrastructure. At the same time, the excess capacity adjustment on permitted return has ensured that over-investment would be penalized.

HEC agrees with the Government that the Equity Base Approach lacks incentive for efficient financing, e.g. under-utilization of debt capital. The Asset Base Approach, on the other hand, provides incentives to ensure continued and adequate asset investment and has been widely adopted in the network businesses of the U. K. and Australia.

On the determination of the rate of return, the cost of capital approach considered in the Consultation Paper would add an extra layer of complexity and cost to the tariff setting arrangements. It provides no guarantee that appropriate investment incentives will exist to induce adequate investment in supply infrastructure for maintaining the existing level of reliability.

However, if changes to the return on investment regime were to be contemplated, the Government must take into account the fact that HEC has made substantial sunk investments on the basis of achieving a certain level of return over the life of those assets.

Return on Asset is most appropriate to Hong Kong.

Performance based regulation (PBR): not suitable for Hong Kong

The main advantage of PBR over traditional rate of return (ROR) regulation is that the former provides the utility with the incentive to aggressively cut expenditure because it would keep a share of the savings. However, international experience has shown that PBR has actually incentivized utilities to under-spend by cutting back necessary maintenance and upgrades. Reliability is thus compromised. Further, PBR is forward looking so if the regulator underestimates the expenditure required or simply "gets it wrong", then the utility will not "overspend" its allowance because it will not be able to recover it even if such expenditure is necessary.

Countries that use PBR are still grappling with its related host of issues, such as the distortions to investment timing. Given that PBR is usually only applied to networks, the Government should carefully consider whether its application to a vertically integrated utility would cause more problems than it solves.

The Government considers that the shorter regulatory periods for PBR, as compared to the SCA, provide more flexibility to make changes. In reality, there is less flexibility for PBR during the set regulatory period. Further, the regulatory reset every 3 to 5 years exposes the utility to a high degree of regulatory risk and leads to utilities and regulators investing substantial resources into the reset process which could be better directed.

The Government's consideration of linking tariffs to economic indicators through the CPI - X mechanism is understandable but not achievable. The CPI factor cannot be relied upon as a good indicator of the prevailing local economic situation. In addition, 90% of HEC's cost inputs are not related to the local inflation rate. This is why the fuel clause account is necessary as fuel costs are not within HEC's control. A CPI-following tariff would make tariffs unreflective of costs and increase HEC's risks. In any case, HEC's tariffs have increased at a rate well below that of inflation over the last 20+ years since 1983.

The Performance Based Regulation approach is not suitable for Hong Kong.

Increased interconnection: illusory benefits

HEC and CLP have been interconnected since 1981 for emergency backup, sharing of reserve capacity and sharing of spinning reserve. The economic benefits have been significant and fully captured.

HEC is of the view that there are several characteristics of the Hong Kong electricity market that make the benefits of increased interconnection illusory. HEC's analysis indicates that the costs of any new interconnection would be higher than the benefits of deferring new generation.

The geographic proximity and similar load profiles of HEC and CLP mean that peaks and troughs in the HEC and CLP systems generally occur at the same time. This means that any reserve sharing benefits provided by further interconnection between HEC and CLP would be minimal.

The full system efficiency benefits that might arise by allowing the power companies to purchase power from each other would be impeded by the long-term take-or-pay commitments which both HEC and CLP have in place.

Finally, utilizing interconnection for regular (rather than emergency) electricity transfers would bring with it increased risks to supply reliability. Experience from overseas, and in particular the recent blackouts in the U.S., Europe and Australia, indicate that failure of a single piece of equipment can have a cascading effect on a highly interconnected network, leading to multiple failures and even total system breakdown.

In light of these factors, HEC is of the view that the costs and risks associated with increased interconnection outweigh the minimal benefits it may offer.

Several characteristics of the Hong Kong electricity market make benefits of increased interconnection illusory.

New supply sources: reliability and cost issues

HEC agrees with the Government that the Mainland cannot be relied on in the short to medium term as an alternative source of supply for Hong Kong since the Mainland will not have surplus electricity to supply Hong Kong in the foreseeable future.

From an environmental perspective, any spare plants, if available, should be used to phase out the existing highly-polluting, low-efficiency small thermal plants in Guangdong instead of being used for exporting electricity and, indirectly, pollution to Hong Kong. From a reliability perspective, importing supply from the Mainland, whose reliability standard in both generation and transmission systems is not at par with that of Hong Kong, will jeopardize Hong Kong's electricity supply.

Thus even if the supply constraints could be resolved in the longer term, the cost of electricity from the Mainland would unlikely be lower than that from local generation if costs for longer transmission distance, reinforcing the transmission networks, and upgrading the environmental and reliability standards at par with those of Hong Kong are included.

Furthermore, the fact that operators of electricity facilities in the Mainland are not under the jurisdiction of Hong Kong's regulatory authorities would in itself create regulatory risk and uncertainty for operators in Hong Kong. This could lead to under-investment in electricity infrastructure in Hong Kong.

Based on the above considerations, HEC agrees with the Government that it would not be prudent to predicate the development of the Hong Kong electricity market on supply from the Mainland.

For new supply sources of a renewable nature, HEC agrees that their introduction to Hong Kong should be actively explored. However, practical issues such as cost-effectiveness, technical feasibility, safety and supply reliability must be carefully assessed to determine the viability of these new sources of supply.

It would not be prudent to predicate the development of the Hong Kong electricity market on supply from the Mainland.

Grid access for third party users: extreme caution needed

Any proposal in relation to open grid access needs to be considered with utmost caution in the context of its potential impact on system reliability.

At present, Hong Kong enjoys an outstanding level of system reliability. Reliability has traditionally been regarded as being of primary importance in the context of electricity networks. However, international experience has shown that mandated open access has the potential to shift the paradigm of system reliability.

The introduction of mandated open access would also require a completely new legislative framework to deal with issues such as reliability and safety standards, technical standards for connection, access pricing, liability issues, dispute resolution procedures and the establishment of an independent system operator. The costs of establishing and administering this regime are likely to be extremely high. These costs would ultimately be borne by consumers.

Open access regimes are based on the assumption that competition is a workable proposition in the relevant market. However, there are currently a number of unique local factors, including the relatively small size of the market, scarcity of land, lack of indigenous fuel supplies and alternative sources of supply, that make it impossible to introduce meaningful competition in Hong Kong in the short to medium term. In the absence of any real prospects of competition in the near future, it would be premature to introduce a mandated open access regime at this stage.

Market size and market characteristics make mandatory open access highly risky.

Legislation over bilateral agreement: begs investment uncertainty and greater risks

Regulation by bilateral agreement has a proven track record in Hong Kong. It has provided certainty to market participants, facilitated investment and resulted in a high level of supply reliability.

There is no doubt that a legislative model under which the Government can change the regulatory framework without the agreement of participants gives the Government greater flexibility. However, greater flexibility will come at the expense of investment certainty and reasonable regulatory risk.

The costs of getting the regulatory framework wrong are enormous. International experience has shown that reform involving electricity industries is complex and has many pitfalls. In particular, inappropriate regulation can lead to systematic under-investment which in turn can lead to infrastructure failure. At worst it can lead to market failure as occurred in California.

The costs of establishing and administering such a regime are also likely to be very high and will ultimately be passed on to consumers.

Greater flexibility for changes would come at the expense of investment certainty. The costs of getting the regulatory framework wrong are enormous.

Independent regulation over Government regulation: no compelling reasons for change

Government regulation has proven to be an efficient and effective means of regulating the electricity industry in Hong Kong. The current approach of sharing regulating responsibility between EDLB, ETWB and EMSD (with the advice of the Energy Advisory Committee (EnAC)) is consistent with that taken in many overseas jurisdictions where there are separate authorities dealing with economic regulation, environmental regulation and technical regulation. Normally, the independent regulators in these jurisdictions are only responsible for economic regulation.

The argument for an independent regulator to oversee the electricity sector has principally arisen in markets where change has centred on the privatisation of state-owned enterprises and where full competition has been introduced. However, arguments for an independent regulatory body lose cogency in Hong Kong where the incumbents are already privately owned and the Government does not participate in the industry.

Electricity is an essential service and the Government should not abrogate responsibility for regulating service provision lightly. In light of this, and the potential costs and regulatory uncertainty associated with introducing independent regulation in Hong Kong, HEC is of the view that there are no compelling reasons to depart from the existing form of Government regulation.

HEC is of the view that there are no compelling reasons to depart from the existing form of Government regulation.

2.12 Conclusions and recommendations

The expiry of the current SCA gives the Government and the community an opportunity to reflect on how the Government's policy objectives have been successfully achieved in the past and how best to ensure the continued achievement of those objectives. It is important that changes are not imposed merely for the sake of change. That said, should the Government and the community decide to introduce changes, such changes must:

- firstly, be a visible improvement on the current regime and not create instability and uncertainty, taking into account the Government's key policy objectives; and
- secondly, provide benefits which unambiguously outweigh the costs and risks of implementing them.

On the first point, HEC believes that the SCA has accomplished great achievements. It has provided a framework which has delivered on the Government's key policy objectives for a number of decades at minimal cost and without Government subsidies. It has provided high reliability at reasonable cost and given a proven framework for the implementation of environmental policy. In other words, the SCA has worked extremely well.

On the second point, HEC has spent considerable time and energy in reviewing the possible changes. HEC does not believe that any of the suggested changes have benefits that demonstrably outweigh both the costs of implementing them and the risks they introduce. Fundamentally, the suggested changes involve the introduction of complexity into what has been, to date, a simple regulatory system that works. With complexity comes both additional costs and the risk of unintended consequences. Experimentation must be avoided.

At the start of this section, HEC referred to the "virtuous circle" which shows that a functioning electricity industry involves a number of mutually reinforcing elements. Even relatively minor changes can alter the dynamics of the industry and the incentives to invest. In seeking change, the community needs to ensure that the changes, if any, do not upset the balance of the existing regime, which has contributed so positively to Hong Kong. On this basis, major changes must be dismissed as unnecessary, misguided and risky.

Accordingly, HEC recommends that the Government's Stage II Consultation should proceed on the basis that the SCA would be retained in its current form. Replacing it with a new regime based on increased interconnection, open access and competition, or a regulatory model governed by legislation and an independent regulator would not represent clear improvements. Indeed, they would raise real issues and risks that contain far-reaching ramifications.

HEC believes the Stage II Consultation should concentrate on:

- agreeing on the elements of the current SCA for the next term given that the existing balance in the SCA is appropriate; and
- refining the SCA by making appropriate adjustments within the current framework that clearly enhance the regime and further deliver on the Government's objectives.

HEC looks forward to working with the Government and other stakeholders in Stage II Consultation.

Experimentation must be avoided. Should changes be introduced, they must offer visible improvements and not create instability and uncertainty. The benefits must outweigh the costs and risks. HEC does not believe the suggested change options offer real and meaningful benefits. HEC recommends that the Government's Stage II Consultation process should proceed on the basis that the SCA would be retained in its current form.

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3 Meeting the Government's policy objectives

- The SCA has met the Government's key policy objective of ensuring reliable supply at a reasonable cost for the last 40 years.
- It has delivered world-class levels of reliability of 99.99+%.
- HEC's tariffs are reasonable when compared to those of other cities.
- The SCA has allowed the Government to implement efficiently and effectively its environmental policy.
- Electricity is an essential service - it is critical to Hong Kong's standard of living, international competitiveness and economic growth.
- There is a trade-off between reliability and prices. In balancing that trade-off, the Government should err on the side of ensuring reliability. This is because international experience has shown that the social, economic and political costs of failed electricity systems are enormous.
- The current balance between reliability and prices is appropriate. It is incorrect to suggest that there has been over-investment or that HEC's returns are too high.
- Recent international experience of electricity industry restructuring has had mixed results with very few clear success stories. It has shown that the issues are complex and the costs to society of introducing the wrong model far outweigh the potential benefits.
- There has been a backlash against the global trend towards complex electricity reform. It does not always lead to benefits for consumers. Tariff reductions have often been transitory at the cost of poorly maintained systems incapable of meeting future demands.
- There is no perfect model for the regulation or structure of electricity industries. Each model has its limitations.
- The SCA is simple and low-cost. Many of the suggested changes introduce complexity and will be expensive to implement and maintain. Ultimately, the associated costs will be borne by consumers.
- Any new model must demonstrate that its benefits will clearly outweigh its costs and will deliver outcomes demonstrably superior to the SCA.
- While the changes discussed in the Consultation Paper might give rise to some benefits, this is not certain. In the meantime, they will involve increased costs, introduce new issues and potentially give rise to sub-optimal and unintended outcomes.
- The SCA has a proven track record and should be retained in its current form.

Government's key policy objective

The Government's key policy objective is:

“to ensure that consumers receive reliable, safe and efficient electricity supply at reasonable prices while minimising environmental impact caused by the generation and use of electricity.”²⁰

HEC supports and reaffirms this objective. As set out below, the SCA has clearly met this objective.

Reliability

The Government notes:

“We enjoy a high level of supply reliability that currently exceeds 99.99% which is among the highest in the world...”²¹

This level of reliability is appropriate for advanced economies that have become increasingly dependent on a secure and adequate electricity supply.

Hong Kong has high-density and high-rise living and a heavy reliance on elevators and electrified transportation systems. According to a recent high-rise building survey²² which ranks 100 international cities according to the total number of floors of their high-rise buildings, Hong Kong has been ranked first. Hong Kong is followed by New York City and Seoul as a distant second and third respectively (as shown in Figure 4). Further, because of Hong Kong's climate, there is also a high penetration of air-conditioning which is considered crucial to lifestyle and working environments. Hong Kong people are also demanding, and they expect the highest standards to be maintained at all times.

The importance of reliable electricity to a metropolitan city cannot be emphasized enough. In fact, Hong Kong is not alone in this aspect. Manhattan Island of New York City, another metropolitan city and a leading world-class financial centre whose service territory is similar to that of Hong Kong, also warrants high supply reliability. The New York Public Service Commission and the City of New York have both deemed that double contingency planning and “five nines” (i.e., 99.999%) of reliability are appropriate for Manhattan Island.²³

HEC's planning criterion only caters for single contingency as it does not have the luxury of employing New York City's planning criterion which would require much more investment. Despite this, HEC has been able to maintain the same “five nines” of reliability as a result of good asset management skills, thorough planning, quality construction, and regular training of operating and maintenance staff on top of timely and sensible investments.

²⁰ Consultation Paper, p 1.

²¹ Consultation Paper, p 6.

²² Emporis (April 2005), www.emporis.com.

²³ On February 26, 1997, New York State Public Service Commission issued *Order Adopting Changes to Standards on Reliability and Quality of Service* in Case 96-3-0979, setting the minimum standards for Manhattan Interruption Duration Hours (CAIDI) of 3.75 and Interruption Frequency (SAIFI) of 0.015. , When multiplied together, the CAIDI and SAIFI values yield a minimum reliability level of 99.99936% supply availability.

In view of the fact that Hong Kong has much more high-rise buildings than New York City which has a high supply reliability requirement of 99.999%, Hong Kong obviously deserves the highest reliability level in the world.

Rank	City	Population	Buildings ^a	Points ^b	Reliability ^c
1	Hong Kong	6,787,000	7,422	114,486	99.99+%
2	New York City	8,115,135	5,444	35,406	99.9992%
3	Seoul	10,331,244	2,831	15,590	99.9963%
5	Singapore	3,437,300	3,503	13,147	99.9998%
7	Tokyo	8,130,408	2,069	9,223	99.9977%
14	Sydney	4,201,500	802	4,073	99.9909%
23	London	7,172,036	1,295	2,741	99.9931%
36	Paris	2,152,467	248	1,785	99.9968%
52	Taipei	2,719,293	152	1,228	99.9991%

Notes:

a) A high-rise building is defined as a building 35 meters or greater in height, which is divided at regular intervals into occupiable levels.

b) Points per Building:

12 - 19 floors = 1 point	60 - 69 floors = 200 points
20 - 29 floors = 5 points	70 - 79 floors = 300 points
30 - 39 floors = 25 points	80 - 89 floors = 400 points
40 - 49 floors = 50 points	90 - 99 floors = 500 points
50 - 59 floors = 100 points	100+ floors = 600 points

c) 2003/04 figures from web research.

Figure 4: High-rise building survey and supply reliability of major cities, April 2005

Reasonable prices

The Consultation Paper shows²⁴:

- in general, electricity bills account for less than 2% of the general household expenditure for residential customers;
- a recent survey indicates electricity bills constitute less than 10% of the monthly operating costs for the majority (77%) of the non-residential customers surveyed; and
- HEC's residential tariffs are in the middle range when compared to those of other major cities.

This is consistent with HEC's own analysis (see section 4) that HEC's tariffs are reasonable in a range of comparisons with:

- OECD countries;
- major world-class cities ; and

²⁴ Consultation Paper, pp 6-8.

- the 11 largest U.S. cities.

Notwithstanding that HEC's rates are in the middle range of those in the above locations, HEC's customers are receiving greater reliability.

Further, increases in HEC tariffs have been well below CPI increases since 1983 the first full operating year of Lamma Power Station, even though this has included an unusual period of deflation in Hong Kong.

Environment

In addition to being instrumental in safeguarding supply reliability, the SCA is a cost-effective framework for environmental protection. It has proven to be a particularly efficient and effective means for the Government to implement its environmental policies, and energy efficiency and conservation programmes. It gives the Government a very simple and transparent mechanism to strike the balance necessary between environmental protection and the level of tariffs.

New environmental measures impose additional costs. In a deregulated regime, in which competition is based on the short-term marginal costs of generation, generation companies have no incentive to improve the environmental facilities and performance of their generation plants. However, under the SCA, the Government can introduce new environmental standards and give investors the confidence that the costs of meeting those standards will be recovered.

HEC's record of environmental achievements listed below illustrates the ability of the existing SCA regime to deliver on environmental objectives while maintaining tariffs at a reasonable level.

- The Pacific Basin Economic Council (PBEC), an international organization dedicated to promoting economic co-operation/development, awarded HEC with a Silver Award in its prestigious PBEC Environmental Awards in 2004. This is the first time for a power utility receiving this award.
- HEC is presently installing the first commercial scale wind turbine in Hong Kong. This wind turbine, which will be commissioned in 2006, is an important milestone in the introduction of renewable energy to Hong Kong.
- HEC's first natural gas-fired generating unit is under construction and will use liquefied natural gas (LNG), an environmentally friendly fuel with low emissions. With the commissioning of this gas-fired unit in 2006, HEC's outstanding environmental performance will be further enhanced.
- HEC is the first power utility in Asia (except Japan) to install the flue gas desulphurization (FGD) plant for its coal-fired units. FGD plants remove more than 90% of SO₂ from the flue gas. In addition to FGD plants, HEC has also installed low-NO_x burners and electrostatic precipitators. These state-of-the-art technologies are very effective in reducing emissions:
 - low-NO_x burners significantly reduce NO_x emissions by two thirds;
 - the electrostatic precipitators together with FGD plants can remove about 99.8% of particulates from the flue gas.

- HEC only uses high quality coal with less than 1% sulphur content for electricity production.
- The retrofitting of the freshwater closed-loop submerged scraper conveyer (SSC) bottom ash systems into all the existing coal-fired units eliminates processed discharge into the sea.
- Every year, Lamma Power Station uses more than 100,000 tonnes of wastewater recovered from various operating processes and collected rainwater. The using of wastewater and rainwater (approximately 7% of the annual total freshwater consumption of the power station) helps to conserve this precious resource and allows a drastic reduction in effluent treatment as well as discharges to the sea.
- To promote the use of energy efficient appliances, HEC implemented an energy efficiency rebate program between 2000 and 2003 that has resulted in annual electricity saving of about 50GWh. Furthermore, there are educational programs that include the Smart Power Campaigns and the web-based energy efficiency education kits for primary and secondary school students. The kit for primary school students was completed in 2003 while that for the secondary school students will be completed in 2005.
- Public awareness of environmental protection continues to be raised through promotional activities such as sponsoring the establishment of an energy efficiency centre in the Science Museum and various research studies, e.g. research on the use of coal ash as artificial reefs for marine conservation.

Of course, environmental objectives need to be balanced against the additional costs they impose. This is a case where there is a tension between the objective of reasonable tariffs and emission reductions and so the caps imposed on emissions from generators must be practical and achievable at a reasonable cost.

However, HEC recognizes that the extension of the Kyoto Protocol to Hong Kong relating to greenhouse gases²⁵ and the commitment of the Government and the Guangdong Provincial Government to reduce other emissions by 2010 mean that further reductions will be required.

HEC has always complied with its environmental obligations and will continue to work with the Government to reduce emissions further in the most cost-effective manner possible.

3.1 Electricity as an imperative

Electricity is an essential service; it is not a luxury. It is a critical input into the creation and provision of all goods and services. Reliable supply is indispensable to a modern and competitive economy and to ensuring continued economic growth.

²⁵ Although the HKSAR, as part of China, is not required to meet specific emission reduction targets, the government is required to submit reports on greenhouse gas emissions to the United Nations from time to time.

A business competitiveness survey conducted by the Chinese University of Hong Kong in 2004 indicated that reliable supply is a very important consideration in deciding where to set up business and that reliability is more important than tariff levels.²⁶

A Government survey of domestic consumers in 2003 indicated that nearly 50% of households ranked reliable electricity supply as their number one priority.²⁷

*“Today, the use of electricity is both indispensable to modern life and an essential part of our very well being. However, it has become so pervasive that it is “transparent” to most consumers, at least until there is an outage. Were it possible to turn off our entire electric power system for a few hours, and assess the impact, the full measure of electricity’s role in the economy would become evident. Few processes other than some space heating, most transportation, and agriculture would continue to function, and even then poorly, constituting a loss of about \$1 billion per hour. The entire economy would stop.”*²⁸

Despite this, it is only when the “lights go out” that the importance of reliability is recognized. For example, the blackout in 2003 affecting the eastern U.S. and Canada resulted in an estimated economic loss of up to US\$10 billion.²⁹

3.2 Should reliability be sacrificed for lower tariffs?

One of the major criticisms of the SCA is that HEC’s returns are too high. This arises primarily from the perception that HEC is over-investing in electricity infrastructure.

This criticism is incorrect for three reasons:

- HEC’s returns are reasonable when benchmarked against comparable companies and as rated by the stock market;
- the levels of investment have been reasonable and mechanisms exist under the SCA to ensure prudent investment by penalising over-investment; and
- the SCA has delivered an appropriate balance between reliability and tariffs.

These issues are explored in more detail in section 4.

²⁶ The Chinese University of Hong Kong and Lingnan University “A Report on the Survey of the Cost Competitiveness of Hong Kong Businesses” (October 2004).

²⁷ HKSAR Census and Statistics Department “Thematic Household Survey Report No. 17” (April 2004) p 30.

²⁸ S. Massoud Amin and Clark W. Gellings 2005. “The North American power delivery system: balancing market restructuring and environmental economics with infrastructure security.” Energy-The International Journal, forthcoming.

²⁹ U.S. - Canada Power System Outage Task Force “Final Report on the August 14, 2003 Blackout in the United States and Canada” (April 2004) p 1.

To the community, each unit of electricity (1 kWh) costs around HK\$1. However, for each unit of electricity unserved, the cost to the community from stoppages of various social and business activities can be many times higher. A very conservative estimate of such cost in the U.S. is about HK\$40 per unit.³⁰ This can be best illustrated by considering a hypothetical example of Hong Kong's supply reliability declining from 99.99+% to 99.00% that would result in a 1% probability of service interruption, or about 87 expected unserved hours per year. Based on the 2004 annual reports of Hongkong Electric Holdings and CLP Holdings, Hong Kong's average demand per hour is about 4,478 MW. The 1% reliability deterioration would cost the entire community of Hong Kong approximately HK\$15 billion per year.³¹

Accordingly, HEC supports the Government's comment that "[w]e should therefore ensure that the future regulatory regime includes appropriate provisions to induce adequate and reasonable investment in electricity supply infrastructure."³²

In trying to strike the right balance, it is imperative that the Government ensures that Hong Kong's electricity systems are reliable. International experience (described below) has shown that the economic impacts of under-investment in electricity infrastructure flowing from returns being set too low are extremely high and costly. As such, there should be a bias towards ensuring reliability when balancing the trade-off between reliability and costs. This is because "[t]he costs of inadequate electricity capacity are much, much greater than the costs of extra electricity capacity."³³

3.3 International experience

The last 20 years have seen extensive electricity market restructuring, deregulation and new methods of regulation. As noted by the Government in its review of other economies, electricity market reform has led to mixed outcomes.³⁴

There are a number of lessons to be learned from the reform experience of other countries.

- Electricity is unlike any other commodity in that it cannot be stored and demand and supply must be kept in balance at all times. This means that, unlike other commodity markets, deregulated electricity markets are very complex.

³⁰ Woo and Pupp (1992), "Cost of service disruption to electric consumers" Energy 17(2): pp 109-126; Keane and Woo (1992), "Using customer outage costs to plan generation reliability" Energy 17(9): pp 823-827; Roques, Newbery and Nuttal (2005), "Generation adequacy and investment incentives in Britain: from the Pool to NETA". Reference unserved costs in the U.S. (PG&E) and the U.K. (National Grid) were US\$17/kWh and £2.816/kWh respectively.

³¹ 4,478 MW per hour x 87.6 hours unserved per year x HK\$40,000/MWh unserved is about HK\$15 billion per year.

³² Consultation Paper, p 13.

³³ Watts, P.C. 2001. "Heresy? The case against deregulation of electricity generation." *Electricity Journal* 14(4): pp 19-24.

³⁴ Consultation Paper, p 10.

- Electricity is demand inelastic but supply and demand has to be continuously and instantaneously balanced. The electricity markets are therefore particularly susceptible to abuse of market power. Indeed it has been claimed that most wholesale electricity markets around the world are subject to the abuse of market power by large firms.³⁵
- As recognized by the Government there is no universal model for market reform and local factors must be taken into account.³⁶
- The costs of getting market reform wrong are enormous. The costs of the failed Californian market reform are more than US\$50 billion.³⁷
- The impact of regulation cannot be overstated. Inappropriate regulation has led to systematic under-investment in a number of countries with consequent infrastructure failure at a huge cost to society.³⁸
- The complexities of reformed markets mean that they propagate new regulations and regulatory staff. These institutions and arrangements are expensive to establish and maintain. The costs are generally measured in tens of millions, if not hundreds of millions, of dollars.³⁹ Ultimately, these costs are priced into tariffs and passed through to consumers.

The failures and inadequacies of market reform have led to a critical rethink by policy makers, economists and consumers on the benefits of reform. For example:

- *“Two thirds of the states have figured out that deregulation is a road to ruin.”* (Consumer Federation of America)⁴⁰
- *“At-cost electricity has buttressed Ontario's economy for many years. A risky experiment with deregulation of electricity would further destabilize an already unstable economy. Deregulating electricity would cause soaring rates and reduced reliability, leading to increased production costs - and unemployment.”* (Ontario Electricity Coalition)⁴¹
- *“We urge FERC and state legislatures to pause in their deregulation efforts. In our judgment, most regional markets will not be sufficiently competitive so that consumers will see net benefits.”* (Economists S Blumsack, D Perekhodtsev, Professor L Lave)⁴²

³⁵ Fabra N and Harboud D, “Market Power in Electricity Markets: An Overview of the Theoretical and Empirical Literature” (2001).

³⁶ Consultation Paper, p 10.

³⁷ Lave, L.B., J. Apt and S. Blumsack (2004), “Rethinking electricity deregulation”, Electricity Journal 17(8): p 11.

³⁸ Refer to Appendix 1.

³⁹ Refer to Appendix 2.

⁴⁰ Consumer Federation of America, “The Federal Response to the 2003 Blackout: Time to Put the Public Interest First” (10 September 2003) p 1.

⁴¹ http://www.electricitycoalition.org/main_pages/7reasons.html

⁴² Blumsack, S, Perekhodtsev, D and Lave, L, “Market Power in Deregulated Wholesale Electricity Markets: Issues in Measurement and the Cost of Mitigation”, The Electricity Journal (November 2002) p 23.

- *“The effect of deregulation on electricity prices is not clear. There have been some reductions, but in some cases prices were coming down at a faster rate before deregulation. Prices will go up with increased fuel costs, which they would with or without deregulation. There has been a good deal of market manipulation by generators and suppliers and the benefits are not yet a foregone conclusion ... in the regulated sectors of the market, transmission and distribution capital investment has declined at a time when large amounts of assets are reaching the end of their design life.”* (E Blauvelt, Partner of ABS Energy Research)⁴³
- *“The Queensland Government's decision not to implement FRC [full retail contestability] was based on a comprehensive analysis, which indicates the benefits of introducing FRC do not outweigh the costs. In particular, the Government was concerned the FRC could result in significant price rises for regional customers.”*⁴⁴
- *“...flawless implementation of the government's plan may yield a small net benefit ... , which can be easily wiped out by a less-than-perfect transition to privatization and competition.”* (Economists A. Tishler, J. Newman, I. Spekterman, and C.K. Woo)⁴⁵
- *“As someone who early on was a strong supporter of restructuring, I now seriously question whether at this time we are capable of doing it right.”* (K. Costello, senior economist of the National Regulatory Research Institute of the U.S.)⁴⁶

3.4 Weighing up the benefits of reform

The negative experiences of other countries do not mean that changes or adjustments should be rejected out of hand. However, they do highlight the risks and costs involved, and Hong Kong therefore needs to act with extreme caution.

Changes, if any, need to be carefully thought out and introduced incrementally. This would ensure that the Government can assess whether the anticipated benefits have actually arisen at each stage. The Government could then decide whether it should proceed further.

⁴³ Blauvelt, E, “Deregulation: Magic or Mayhem?”, The Electricity Journal, (August/September 2004) pp 46-47.

⁴⁴ <http://www.energy.qld.gov.au/electricity/nem.html>

⁴⁵ Tishler, A., J. Newman, I. Spekterman, and C.K. Woo. 2004. “Cost-benefit analysis of reforming Israel's electricity industry.” Energy Policy forthcoming

⁴⁶ Costello, K. 2003. “The shocking truth about restructuring of the U.S. electricity industry.” Electricity Journal 16(5): p11-19.

As part of this process, the first few steps or changes also need to be reversible. Hong Kong's power suppliers have made huge investments in long-term infrastructure and a significant cost of reform in other jurisdictions has been stranded costs related to sunk investments made on the basis of the old regime. If major changes are contemplated, these costs should be minimized or even avoided by a measured and proper transition. Further, once an inappropriate regulatory system has been introduced, it would be very difficult and costly to unravel it, and that invariably would lead to an erosion of confidence in the new arrangements by all stakeholders.

HEC agrees with the approach advocated by the Australian Productivity Commission (in its recent review of gas regulation in Australia) that applies equally to changing existing regulation as well as making the decision to regulate:

“In considering whether to intervene and the appropriate form of intervention, governments need to firstly consider the benefits from intervention (that is, the size of the problem). Governments then need to consider possible forms of intervention - do they generate benefits and at what cost do they achieve those benefits? Governments should only intervene where it generates net benefits, and should implement the form of intervention that generates the greatest net benefits.”⁴⁷

What are the perceived problems?

When considering Hong Kong electricity market's future direction and development, the first step is to identify the perceived problems with the SCA and consider the magnitude of those problems. The Government identified the following criticisms of the SCA⁴⁸:

- the permitted rates of return are considered high in the present day economic climate;
- the permitted return, based on fixed assets, is perceived to have encouraged over-investment;
- the permitted rate of return fixed over a 15-year period lacks flexibility, as amendments to the SCA cannot be made without the consent of the parties involved; and
- the annual tariff and auditing reviews lack transparency.

HEC believes that these 'problems' are overstated and arise from an incomplete understanding of the SCA and the environment in which electricity infrastructure providers operate. Each of these issues is considered in detail in the relevant sections below but HEC's responses can be summarized as follows:

- Permitted return: All things considered, the existing permitted return has proved to be reasonable to investors, sufficient to attract investment, and has provided electricity supply at reasonable tariff, high reliability, and excellent services.

⁴⁷ Productivity Commission, “Review of the Gas Access Regime” Report no 31 (2004) Canberra, p 84.

⁴⁸ Consultation Paper, p 9.

- Investment level: HEC's investment in electricity infrastructure has been prudent and timely under the regulatory scrutiny of the Government. Furthermore, any over-investment would have been penalized by an excess capacity adjustment that would be deducted from the permitted return.
- SCA time-frame: As recognized by the Government, the uncertainties arising from a shorter agreement period would deter continued or longer term investment by the power companies. Given the long-term nature of investment in electricity infrastructure and the long-term contractual requirements, the current 15-year regulatory period is appropriate.
- Transparency: HEC is willing to work with the Government further on increasing the transparency of the tariff setting process, subject to full confidentiality for commercially sensitive information that is passed to the regulator.

What are the proposed options?

The Consultation Paper suggests the following options:

- (d) modifying the SCA by adopting new regulatory mechanisms;
- (e) introducing a new regime involving one or all the options of increased interconnection, new supply sources and open grid access; and
- (f) a new legislative framework and institutions.

HEC is concerned that many proponents for change see reform as a means to an end, namely the lowering of tariffs. Nevertheless, the costs incurred for the changes may actually be higher than the benefits, if indeed there were benefits to be derived. In fact, international experience has shown tariff reductions, even if realized, are often transitory and at the cost of poorly maintained systems which are incapable of meeting future demands. Market reform in California is a classic example where rates were mandated to fall but the ultimate cost to consumers and the State far exceeded those temporary benefits. The failure of electricity restructuring in Ontario is another well-documented example.⁴⁹

Further, caution must be taken before "cherry picking" elements from other regimes. For example, one suggestion is to introduce a weighted cost of capital approach to determining the permitted rate of return as used in the U.K. and Australia. This is a prescriptive approach with many subjective elements. However, this approach requires appeal mechanisms as owners of sunk assets are at the risk of poor regulatory decisions. In the last two years in Australia, there have been a number of regulatory decisions on this issue that have been successfully appealed.⁵⁰ Even experienced and well-resourced regulators make mistakes. Implicitly, the introduction of this one change will require further resources for the Hong Kong regulator to make such determinations and a new regulatory framework with appeal mechanisms.

⁴⁹ Woo, C.K., D. Lloyd, and A. Tishler. 2003. "Electricity market reform failures: UK, Norway, Alberta and California." *Energy Policy* 31(11): 1103-1115; Trebilcock, M.J., and R. Hrab. 2005. "Electricity restructuring in Ontario," *Energy Journal* 26(1): p 123-146.

⁵⁰ Application by Epic Energy South Australia Pty Ltd [2003] A Comp T5 (10 December 2003); Application by GasNet Australia (Operations) Pty Ltd [2003] A Comp T6 (23 December 2003).

The risks and benefits of each option are considered elsewhere in this submission. While HEC acknowledges that some of the options (if implemented properly) could give rise to benefits, HEC is of the view that these benefits do not clearly outweigh the costs or the risks that they introduce.

As a general comment, each of these options introduces a greater level of complexity and will be expensive to implement and maintain. These costs will be significant and must be factored into the analysis.

The efficiency gains are not clear or quantified. The problems which the proposed changes seek to address are not of such significance as to require an overhaul of the SCA. The outcomes of these proposals are not certain and not demonstrably superior to those achieved under the SCA in the last 40 years.

The consultation debate must not be driven by ideology – that one form of industry structure or regulation is superior to another. Experience shows that there is no perfect model. Each model has its flaws and limitations. In changing the regulatory regime, Hong Kong will simply replace one set of issues with another set; this potentially leads to a downward spiral of ever increasing regulation.

*“... - regulators acknowledge distortions brought about by regulation, but then begin a quest to control them through more regulation. Professor Kahn, one of America’s most famous economists, described the effect as the ‘tendency of regulation; once undertaken, to become increasingly pervasive and thoroughgoing’”*⁵¹

Hong Kong has a simple, low-cost regime which has delivered on the Government’s objective without the need for Government funding or subsidies. Where the goal is light-handed regulation, Hong Kong’s electricity market is a proven success, when compared to those in OECD countries like Canada, U.S. and U.K.

There is no clear case for significant changes but a very real risk of jeopardising Hong Kong’s existing supply of safe, reliable and reasonably priced electricity.

While the changes discussed in the Consultation Paper might give rise to some benefits, this is not certain. In the meantime, they will involve increased costs, introduce new issues and potentially give rise to sub-optimal and unintended outcomes. In contrast, the SCA has a proven track record and should be retained in its current form.

⁵¹ Productivity Commission, “*Review of the Gas Access Regime*” Report no. 31 (2004) Canberra, p 155.

4 Return on investment

The criticisms of HEC's returns under the SCA are overstated or misconceived.

- The SCA does not guarantee HEC's returns. In fact, HEC has substantially under-recovered the revenue needed to enable it to earn the permitted return under the SCA.
- HEC's tariffs are in line with the tariffs in OECD countries and other major cities. In addition, for their tariffs, Hong Kong customers enjoy a higher level of reliability than customers in other cities.
- It is a fundamental principle that HEC's permitted rate of return should be equal to that available for similar investments (i.e. the opportunity cost of investing in electricity infrastructure). On this basis, HEC's permitted rate of return under the SCA is reasonable.
- Electricity infrastructure is a long-term investment and critics are judging returns on snapshots of the economic cycle rather than over the longer term. If changes to the return on investment regime were to be contemplated, the Government must take into account the fact that HEC has made substantial sunk investments on the basis of achieving a certain level of return over the life of those assets.
- Comparisons being made with regulated rates of return in other countries and Hong Kong are misleading unless the differences between Hong Kong and other countries are properly taken into account.
- HEC's rate of return is a "nominal" rate. When proper comparisons with other jurisdictions are made, HEC's return is reasonable taking into account the difference between "nominal" and "real" rates of returns and the actual economic situation of Hong Kong.
- HEC's investment in electricity infrastructure has been appropriate. The excess capacity adjustment on permitted return has ensured that any over-investment would be penalized.

The Consultation Paper raises a number of options for changing the way in which returns are determined under the SCA:

- The return on equity approach would encourage an inefficient capital structure and, in any case, does not address the criticisms of the current approach under the SCA.

- **The cost of capital approach to determining the permitted rate of return raises more issues. Far from being objective and transparent, it contains a number of uncertainties and subjective elements. It will be expensive to implement as it will require HEC and the Government to undertake detailed investigations and analysis of each component. International experience shows that it involves protracted negotiations (often requiring resolution by litigation or arbitration) and that even experienced regulators have made mistakes using it.**
- **The Development Fund should be retained. It is an important mechanism in the SCA that stabilizes tariffs and is held for the benefit of consumers. HEC has not built up large balances in the fund and the SCA includes capping mechanisms against this occurring.**

HEC does not consider that the benefits of the proposed options are certain or of such magnitude as to justify the very substantive changes proposed to the existing system.

4.1 Rate of return regime under the current SCA

Permitted return

The SCA incorporates a form of rate of return (ROR) regulation. ROR regulation is commonly used in the U.S. for investor-owned utilities. It allows companies to pass through those costs which are necessary to ensure services to customers plus an appropriate return based in part on employed capital to the utility. The issue discussed in this section is the return permitted under the SCA.

In essence, HEC is permitted to earn a return on capital employed in providing the services each year up to the permitted rate of return multiplied by its rate base, i.e. the average value of its net fixed assets. There are then a number of deductions from this permitted return under the SCA.

The rate base comprises the average net fixed assets of the company used to provide the services. This is determined annually as the average of the opening and closing balances of HEC's net fixed assets. Net fixed assets comprise HEC's book cost of electricity-related assets less accumulated depreciation.

It must be remembered that the permitted return under the SCA is not a guaranteed return. In fact, in recent years, HEC has substantially under-recovered the revenue needed to enable it to earn the permitted return under the SCA. A substantial proportion of this under-recovery is as a result of HEC agreeing to ease the tariff pressure on consumers and to assist in the recovery of Hong Kong's economy.

Development Fund

Under the SCA, HEC must maintain a Development Fund.

In any year, HEC may recover sums which are over or under the permitted return. To the extent that HEC has surplus funds after tax and the permitted return, the excess is transferred to the Development Fund. Similarly, if there is a deficit, then HEC may receive funds from the Development Fund but only to the extent that the Development Fund has a positive balance.

The Development Fund is extremely important. Firstly, it helps to stabilize the tariffs charged to customers in that excess Development Funds are returned to customers by charging a lower-than-required tariff in any year when the required tariff increase is deemed too high. Secondly, the fund serves as a buffer for HEC against the risk of under-recovering through its tariffs. Again, as stated, the Development Fund cannot have a negative balance – therefore it does not serve as a guarantee that HEC will attain the permitted return.

The Development Fund is not an asset of HEC but actually represents a liability. It belongs to HEC's customers and is held for their benefit. The fund assists HEC to finance its current investment but HEC's shareholders have to pay an interest equal to 8% of the average of the opening and closing balances of the fund into the Rate Reduction Reserve. The balance of that reserve is used for a tariff rebate to all customers.

Deductions from the permitted return

There are a number of deductions from the permitted return before arriving at the net return to shareholders:

- (a) **Interest charges** – Interest charges at a rate up to 8% that are incurred for financing the fixed assets are deducted from the permitted return.
- (b) **Interest on increased customer deposits** – Interest up to a rate of 8% per annum on the increase in the average of the opening and closing balances of customer deposits from a base 1998 balance is deducted from the permitted return.
- (c) **Charge on the Development Fund** – Each year, 8% of the average of the opening and closing balances of the Development Fund must be transferred to the Rate Reduction Reserve from HEC's permitted return. The balance of the Rate Reduction Reserve is used to reduce, by means of rebates, the tariffs charged to customers.
- (d) **Excess Capacity Adjustments** – described below

Excess Capacity Adjustment

In May 1999 the Hong Kong Government and HEC amended the SCA to introduce an Excess Capacity Adjustment. Broadly, an Excess Capacity Adjustment is a penalty on HEC building additional generating units (Additional Units) from 1 January 1999 not justified by sufficient demand. Additional Units cover both installation of new generating units or the addition of capacity to an existing generating unit.

A formula is utilized to determine whether a case of excess capacity exists. Once a case has been confirmed, an agreed percentage of the costs of the Additional Unit are not counted as fixed assets and will not attract a net return for shareholders. This excess capacity adjustment on permitted return has ensured that over-investment will be penalized.

Through the 2003 Interim Review of the SCA, from 1 January 2004, the agreed percentage rose from 40% to 50%.

4.2 Criticisms of returns under the SCA

The main criticisms of the SCA in this regard are:

- Electricity tariffs are too high;
- the permitted rates of return are considered high in the current economic climate;
- the permitted return, based on fixed assets, is perceived to encourage over-investment; and
- there has been over-investment in generation capacity.

In the following sections, HEC shows that these criticisms are unjustified.

4.3 Criticism 1 - Are HEC's tariffs too high?

This is simply not borne out by the evidence that shows HEC's tariffs are in the middle range of tariffs charged in OECD countries and in other major cities around the world.

Government's comparison of residential tariffs of major cities 2005

The following table is from the Government's own Consultation Paper⁵²:

City	Tariff range (HK\$/kWh)
Tokyo (Tepco)	1.41 – 1.73
London (London Energy)	1.17 – 1.68
San Francisco (PG&E)	0.89 – 1.41
Sydney (EnergyAustralia)	0.75 – 1.23
Hong Kong (HEC)	0.82 – 1.18
Brisbane (Energex)	0.75 – 1.15
Hong Kong (CLP Power)	0.85 – 0.99
Singapore (Singapore Power)	0.8
Taipei (Taipower)	0.51 – 0.65

Based on: (i) tariff rates of the respective companies as at January 2005, (ii) consumption of between 100kWh to 1500kWh per month, and (iii) exchange rates as at January 2005.

However, attention should be drawn to the fact that Singapore Power and Taipower are wholly owned, either directly or indirectly, by the Singapore and Taiwan governments respectively. It is therefore not necessary for them to make commercial returns.

OECD average residential rates for 2003, based on market exchange rates

The Government's data is consistent with that of the International Energy Agency as shown in Figure 5. (OECD countries are appropriate for comparison purposes because many of them have per capita GDP comparable to Hong Kong.)⁵³

Other major world cities

Figure 6 shows the comparison of the residential rates for major world cities based on usage of 500 kWh/month and applicable tariffs as of March 2005.

⁵² Consultation Paper, p 8.

⁵³ This comment is based on 2003 GDP data available from the United Nations Statistics Division, Social Indicators Database as at January 2005.

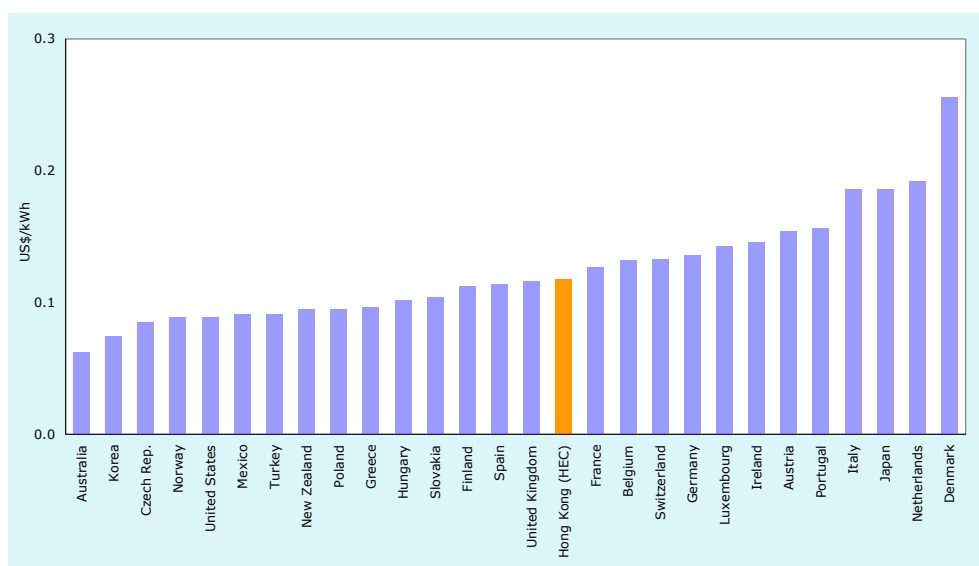


Figure 5: OECD Average Residential Rates, 2003⁵⁴

Most of the cities with the lower rates in the above figure are served by government-owned utilities (e.g. Toronto, Bangkok, Singapore and Taipei). HEC's rates are low when compared to other privately owned utilities serving international cities.

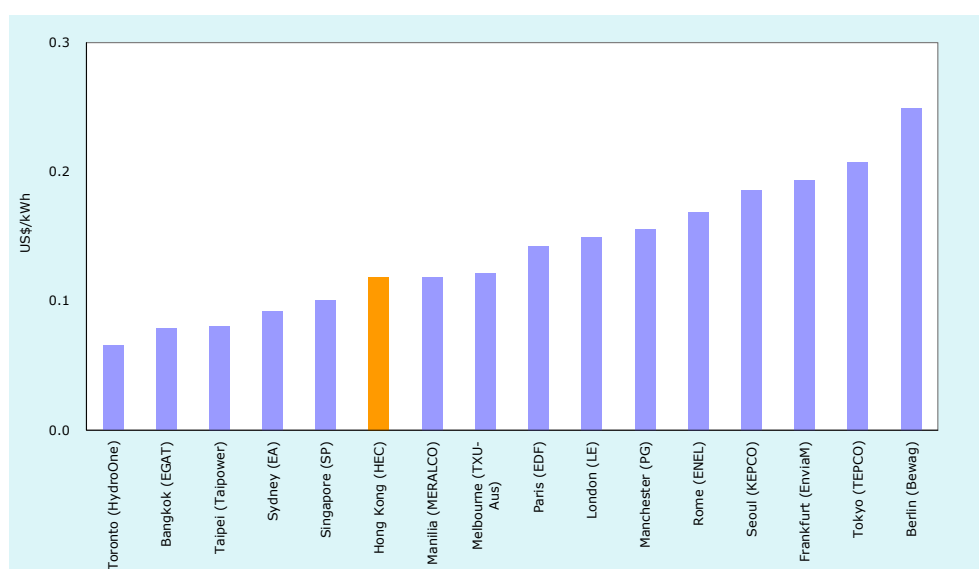


Figure 6: Major World Cities, Residential Rate for 500kWh/month⁵⁵

⁵⁴ International Energy Agency, "Energy Prices & Taxes 4th Quarter 2004" Table 20. All prices for 2003 where available. Most recent data available for Australia (2002), Belgium (2000), Germany (2002) and Spain (2002).

⁵⁵ Applicable tariffs – company web sites.

Major U.S. cities

Figure 7 shows the comparison of the residential rates for utilities serving major U.S. metropolitan areas based on usage of 500 kWh/month and applicable tariffs as of March 2005.

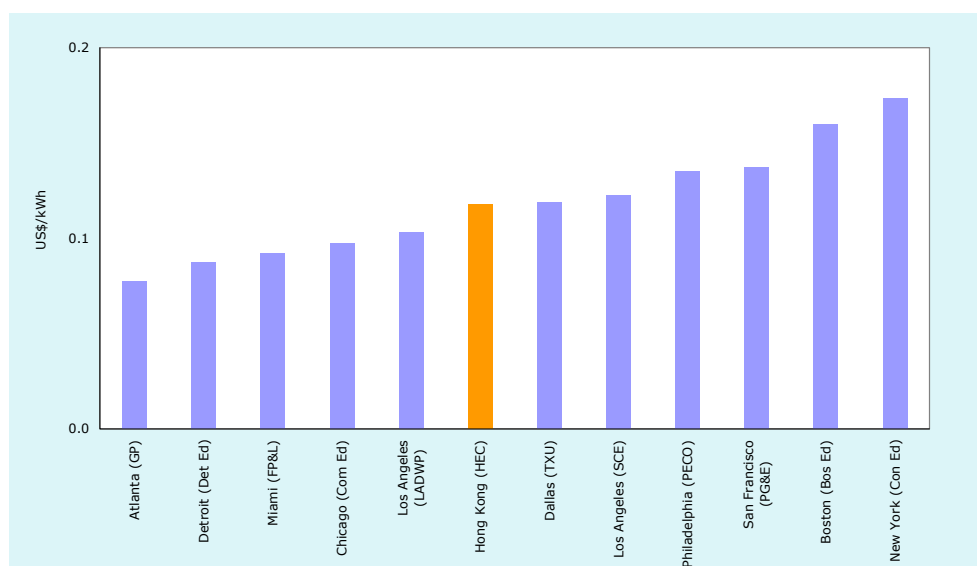


Figure 7: U.S. Cities, Residential Rate for 500kWh/month ⁵⁶

Are these comparisons robust?

Some critics argue that these comparisons are misleading because Hong Kong electricity suppliers enjoy cost advantages over suppliers in other cities. The main argument is that Hong Kong's geographic supply area is small compared to other cities. However, if anything, the reverse is true due to Hong Kong's unique nature:

- Hong Kong Island comprises hilly landscapes, resulting in higher costs to install and maintain electricity infrastructure;
- compared to overseas jurisdictions, underground electricity cables, which are 9-10 times cost of overhead lines for the same capacity and length, are more widely used in Hong Kong;
- Unlike many OECD countries (Canada, U.S. or Norway), Hong Kong does not have indigenous fuel and must import all of its required fuel;
- land and building costs for electricity infrastructure (such as substations) in Hong Kong are very expensive.

⁵⁶ Applicable tariffs – company web sites.

Finally, and very importantly, Hong Kong customers enjoy a higher standard of service (i.e. higher reliability) for their tariffs than most customers in the other cities and countries with whom the above comparisons have been made.

There are also criticisms that HEC's tariffs are higher than CLP's. While this is true for the average tariff, it is not the case for all categories of customers at all levels of consumption. However, it is important to recognize that the tariff differential has nothing to do with HEC earning a higher return than CLP or operating inefficiently. HEC and CLP have almost identical SCAs that stipulate them to earn the same rate of return on fixed assets. Benchmarking studies also confirm HEC to be an extremely efficient power company.

HEC's higher tariff can be explained by the fact that it has a scale of operations and operating environment different from CLP. Other things being equal, HEC requires a higher investment in assets per unit of electricity sold than CLP:

- Being a smaller system, the size of HEC's largest generating plant is 350MW as compared with CLP's 677MW. On transmission voltage, HEC uses 275kV while CLP uses 400kV. These imply higher capital cost per unit for both generation and transmission infrastructures for HEC.
- HEC's power station is on Lamma Island that can only be accessed by sea transportation. The construction cost is therefore higher than that for a power station in the rural area of the New Territories.
- In order to avoid sterilizing large strips of valuable land and to preserve Hong Kong Island's beautiful landscape, the power delivery from the power station to load centres needs to use the more expensive submarine / tunnel / underground cables rather than overhead lines. For the same capacity and length, installing cables requires 9-10 times the cost of overhead lines.
- Various districts on Hong Kong Island have been developed much earlier than the new towns in New Kowloon and New Territories. The lack of proper town planning in the early days, together with hilly topography and congested demography on Hong Kong Island, cause HEC greater difficulties and costs in the siting and construction of electricity infrastructure and subsequent upgrading.
- In response to the higher expectation for better environmental protection from the community and the Government, HEC introduced state-of-the-art environmental protection facilities to its system, e.g. the Flue Gas Desulphurization (FGD) plants in 1993 to reduce 90% of sulphur dioxide emissions of the relevant units.

While the above factors contribute to HEC's higher investment on per unit basis in electricity infrastructure, a look at the following sales-related factors further help explain HEC's higher tariff:

- HEC has a higher proportion of commercial consumption concentrating in daytime and a lower proportion of industrial and residential consumption spreading more evenly throughout the day. This results in a less efficient load factor and lower equipment utilization.

- CLP's local electricity sale is 2.7 times that of HEC. CLP has a better economy of scale, e.g. smaller workforce per unit of electricity sold.
- Electricity sale to China allows CLP to increase their Development Fund that in turn generates a hefty Rate Reduction Reserve. Both the Development Fund and Rate Reduction Reserve help CLP to lower their net tariff.

4.4 Criticism 2 - Are HEC's returns too high?

The answer is no for the following reasons.

- (a) The permitted rate of return should be judged against the opportunity cost of an investment and, on this basis, the permitted rate of return is less than average returns on investments in other Hong Kong utilities or returns available by investing in the Hong Kong Stock Exchange.

This is discussed in section 4.5.

- (b) The best judges of value are the financial markets, not regulators, and Hongkong Electric Holdings stock has not outperformed other listed stocks, contrary to what one would expect if HEC is making above normal profits.

This is discussed in section 4.6.

- (c) Electricity infrastructure is a long-term investment and critics are incorrectly judging returns on snapshots of the economic cycle rather than over the longer term.

This is discussed in section 4.7.

- (d) Comparisons with regulated rates of return in other countries are misleading because they do not account for the differences between Hong Kong and those other countries.

This is discussed in section 4.8.

4.5 Opportunity cost

There is a long line of U.S. cases which makes it clear that the permitted rate of return should be consistent with the returns available for similar investments or, put another way, the opportunity cost of investment.

- *“There is no particular rate of compensation which must in all cases and in all parts of the country be regarded as sufficient for capital invested in business enterprise. Such compensation must depend greatly upon circumstances and locality, among other things, the amount of risk in the business is a most important factor, as well as the locality where the business is conducted and the rate expected and usually realized there upon investments of a somewhat similar nature with regard to the risk attending them.” (Willcox v. Consolidated Gas Co., 212 U.S. 19, 48-49 (1909)) (Emphasis added)*
- *“A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties...” (Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia, 262 U.S. 679, 692-3 (1923)) (Emphasis added)*

The other point to take from these cases is that the opportunity cost applied to Hong Kong should be judged relative to Hong Kong’s environment.

Comparison of returns with other Hong Kong utilities

The Government recognizes, under the opportunity cost approach, *“the need to provide a return that can be earned from a similar investment (such as other utilities)”*.⁵⁷ While other utilities are good guides because they will usually have similar risk profiles, these are not the only investments available and any analysis should not be limited to just utilities.

CLP is obviously of limited value for comparison because it also operates under an SCA. However, Hong Kong and China Gas Co. Ltd. is one of the few, if not the only, Hong Kong utility available for comparison purposes. When compared to this company, HEC’s returns are not too high.

Comparison of returns with other Hong Kong listed companies

HEC’s returns under the SCA are not high when one takes into account actual market conditions over a 26-year period between 1979 and 2004:

- average yearly total return from Hang Seng Index Stocks is around 23%⁵⁸;
- best lending rate average is about 9.24%; and
- the inflation rate has averaged 5.8%.

⁵⁷ Consultation Paper, p 15.

⁵⁸ Yearly total return is calculated as percentage change in level plus dividend yield of the Hang Seng Index

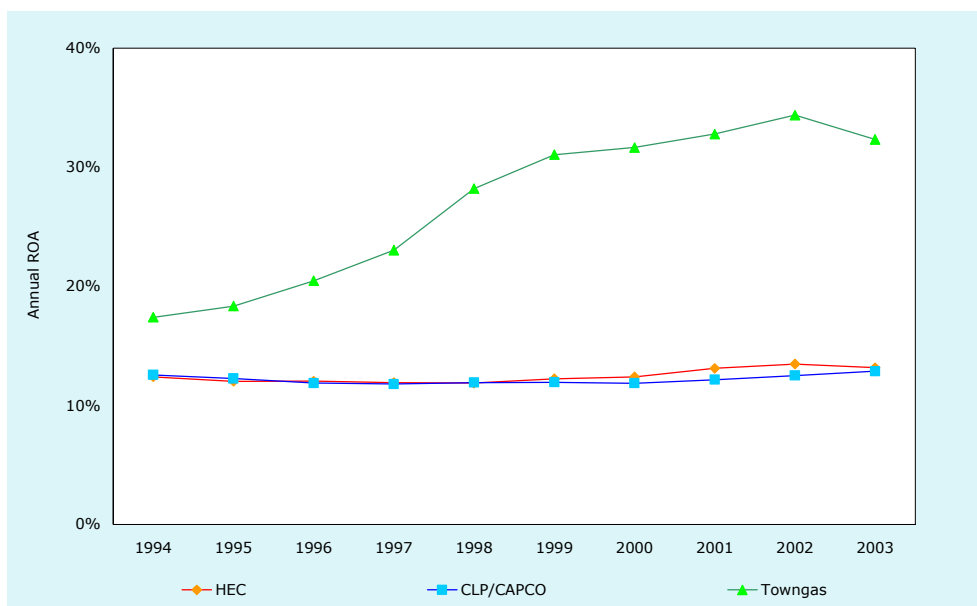


Figure 8: ROA comparison: HEC, CLP/CAPCO and Towngas⁵⁹

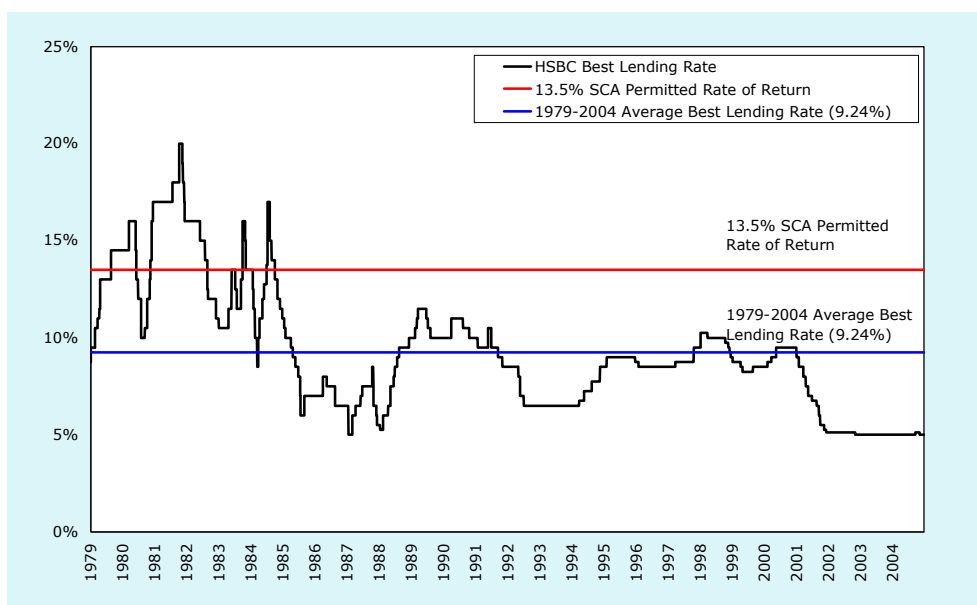


Figure 9: Comparison of Permitted Rate of Return under SCA to HSBC Best Lending Rate⁶⁰

⁵⁹ Calculations are based on data from annual reports of Hongkong Electric Holdings Ltd., CLP Holdings Ltd. and The Hong Kong and China Gas Company Ltd.

⁶⁰ Hong Kong Monetary Authority, HKSAR

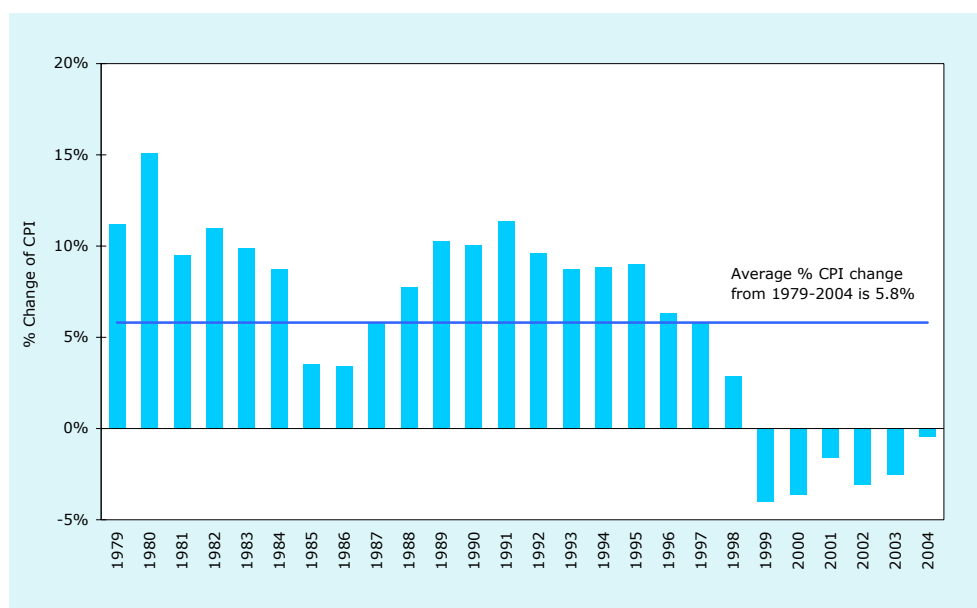


Figure 10: Percentage Change of CPI between 1979 and 2004⁶¹

While it is true that HEC's risk profile may be different from that of other Hong Kong companies listed on the exchange, this is reflected in HEC's lower permitted rate of return. It is also not correct to suggest that HEC faces no risk:

- unlike utilities in other parts of the world, it has no exclusive franchise – in fact, the application of ROR regulation in the U.S. of previously unregulated privately owned utilities was linked to the provision of franchise rights;
- the SCA does not guarantee that HEC will earn the permitted return but in fact caps the permitted return;
- the excess capacity adjustment means that HEC will be penalized if additional generation capacity, which is planned based on forecast demand, cannot be justified by actual demand; and
- HEC's infrastructure investments are long-term, typically a minimum of 35 years, and HEC faces significant contract expiration risk as a result of having long-life sunk assets with no alternative uses.

4.6 Hongkong Electric Holdings' stock performance

If HEC is earning returns that are higher, given its risk level, than those that could be expected by other investment opportunities, then one would expect the stock of the Hongkong Electric Holdings Ltd., which has HEC as its important subsidiary and its main contributor in profit, to outperform the stock market and be considered favourably by investors.

⁶¹ Census and Statistics Department, HKSAR

However, this is not the case, as evidenced by a comparison between Hongkong Electric Holdings' cumulative stock returns (including dividend reinvestment) and those of other stocks listed on the Hong Kong Stock Exchange over a 10-year period.

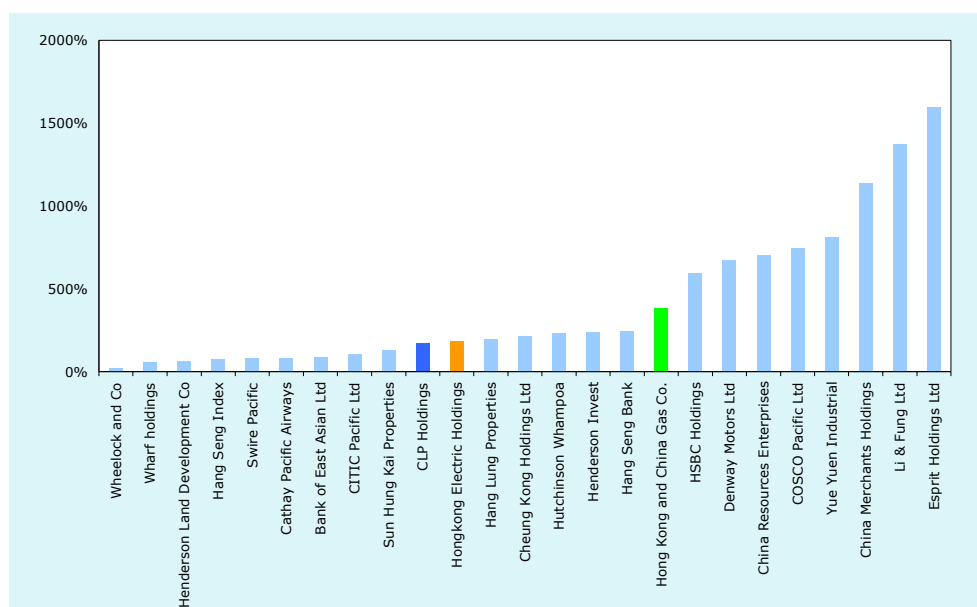


Figure 11: 10-year (1995-2004) cumulative stock returns, including dividend re-investment⁶²

4.7 Electricity infrastructure is a long-term investment

HEC's investments in electricity infrastructure such as generation capacity and networks are long-term. Typically, the life of such assets is at least 35 years and the capital investment must be recovered over this period. Similarly, as HEC has no indigenous fuel sources, it seeks to enter into long-term, low-cost fuel supply arrangements.

Another feature of electricity infrastructure is that it is a sunk investment. It is not movable nor does it have any alternative uses. HEC's stranded asset risk is exacerbated by the fact that it has no opportunity to export power to other markets.

Unfortunately, people focus on a snapshot of returns at a particular time rather than over the full term of the investment. During that term, there may be times when returns may be considered higher than normal but this is balanced out by other periods where this is not the case.

⁶² Bloomberg

A case in fact is that Hong Kong recently went through an unusual period of deflation that led to the perception that HEC's permitted rate of return was too high, i.e. HEC received a windfall. However, in addition to the deflationary period being unusual, this perception fails to take into account periods of high inflation that inevitably occur over the life of a long-term investment.

In considering any changes to the return on investment regime, the Government must take into account the fact that HEC's investments have been made on the assumption that it would receive a certain level of return over the life of the assets. Accordingly, any future regime must take into account the basis upon which these investments were made including, if necessary, distinguishing between the return on existing sunk assets and future investments.

4.8 Comparisons with international rates of return

The Government notes that direct comparisons of rates of return between countries are difficult for a number of reasons, including:

- differences in business ownership, which affect target rates of return and the equity/debt mixes;
- different market structures, which affect the utilities' make-ups and earnings of individual business units;
- business diversification; and
- different regulatory regimes under which the permitted return and actual return can differ.⁶³

HEC agrees with the above reasoning. Despite these difficulties, the Government goes on to state in the Consultation Paper that typical permitted rates of return for vertically integrated investor-owned utilities in the U.S. are in the range of 6-13% and for regulated utilities in the U.K. and Australia are 6-7% and 6-9% respectively.⁶⁴

HEC believes these comparisons with the SCA are misleading for a number of reasons in addition to those set out by the Government above.

Networks only

In the U.K. and Australia, the generation sector is not subject to regulated pricing. Therefore, the rates of return referred to only apply to the transmission and distribution sectors. The risk profile for an integrated utility that must source fuel, build and operate power stations and networks and retail the electricity is very different. Any comparison with the U.K. and Australian rates of return is simply not apt.

⁶³ Consultation Paper, pp 15-16.

⁶⁴ Consultation Paper, p 16.

Rates of return should not be viewed in isolation

In his seminal textbook “The Regulation of Public Utilities”, Charles Phillips noted:

*“In discussing allowed rates of return, however, it must be emphasized that any rate by itself is meaningless unless considered in connection with the commission’s entire order; that is, with the type of rate base and test year employed, with the inclusion or exclusion of construction work in progress (CWIP), and so forth.”*⁶⁵

For example, the permitted return is a function of both the rate of return and the rate base. The same permitted return can be achieved by either a lower rate of return and a higher rate base or a higher rate of return and a lower rate base.

The most commonly used approaches to determining the rate base are “investment cost” and “fair value”. In the SCA, the investment cost approach generally uses the “original cost” or the acquisition cost of the plant. The fair value or current value approach adjusts the rate base to reflect changes in the value of original investments. The adjustments can be based on trended original costs, reproduction cost, or replacement cost.

Generally, the fair value approach results in a higher rate base value than that under the investment cost approach. To compensate for the increase in rate base using the fair value approach, the allowed rates of return for fair value rate base are typically lower than those for rate base under investment cost approach.

This helps explain why HEC’s rate of return is at the higher end. As noted by Charles Phillips:

*“The relationship between the allowed rate of return and the type of rate base employed by the commissions has been analyzed in five studies. In each case, it was concluded that when the commissions adopt either reproduction cost or fair value rate bases, they partially offset the effect of the larger rate bases by granting lower percentage rates of return, but the combined effect of the larger rate base and the lower rate of return is to permit higher levels of earnings in reproduction cost and fair value jurisdictions.”*⁶⁶

In summary, HEC is of the view that the criticisms of its return under the SCA are misconceived. HEC’s 13.5% return is a “nominal” return (i.e. without reference to inflation) and applies equally to generation, transmission and distribution assets. The general misconception is attributed to the 6-9% return in the U.K. and Australia quoted in the Consultation Paper.⁶⁷ First of all, these rates of return are “real” rates (i.e. apply to inflation adjusted asset base). Secondly, HEC’s tariff, which results from the SCA formula of cost pass-through and HEC’s return, is less than the tariff charged to, for example, London consumers as tabulated in the Consultation Paper.⁶⁸ The London tariff is arrived at by similar cost pass-through arrangements and a combination of a market driven return on generation assets,

⁶⁵ Phillips C, “The Regulation of Public Utilities”, Public Utilities Reports, Inc. (1993) p 383.

⁶⁶ Phillips C, “The Regulation of Public Utilities”, Public Utilities Reports, Inc. (1993) pp 383-4.

⁶⁷ Consultation Paper, p 16.

⁶⁸ Consultation Paper, p 8.

and an “inflation adjusted return” on transmission and distribution assets. The fact that HEC’s tariff is lower than the London tariff demonstrates that HEC’s return is not out of step with rates of return in other jurisdictions. Indeed, when proper comparisons are made, taking into account the difference between “nominal” and “real” returns and the market return earned on generation assets, it is evident that HEC’s return is reasonable.

Country specific risk

The U.S. authorities cited in section 4.5 make it clear that rates of return must be “equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties”.⁶⁹ Therefore, any comparison with the U.S. has to consider the specific risks faced by Hong Kong investors versus U.S. investors in utilities when comparing rates of return.

Put simply, electricity infrastructure investment is more risky in Hong Kong than in the U.S.:

- Aside from the difference between a U.S. utility and a Hong Kong power company, the U.S. is generally viewed as a country with lower investment risk than Hong Kong. At present, Hong Kong’s bond carries a country risk premium of 1.05%⁷⁰ when compared to the U.S. Increased economic integration of Hong Kong and China adds to Hong Kong’s country risk premium because China’s bond has a country risk premium of 1.35%.⁷¹ Finally, Bloomberg indicates that Hong Kong’s equity has a country risk premium of 2.5% when compared to the U.S.
- Unlike a U.S. utility, a Hong Kong power company does not have an exclusive franchise, an important point made explicit by the Government.
- Unlike a U.S. utility, a Hong Kong power company has fixed term contract and faces substantial contract expiration risk due to the stranded cost of long-living assets with little alternative use.
- Unlike many U.S. utilities, a Hong Kong power company operates largely as an isolated system, not interconnected to a large liquid wholesale market from which it can procure power and energy to meet its load obligation. Hence, it must be self-sufficient. The long lead-time of plant construction necessitates large capital commitment before demand realization. Demand forecast uncertainty can cause an ex ante prudent investment made to meet expected demand growth to become ex post imprudent because actual demand growth can turn out to be lower than expected. Ex post imprudence, if supported by the excess capacity test results, subjects HEC to penalties, uncommon in the U.S. for capital expenditure for implementing expansion plans already approved by a regulator.

⁶⁹ Willcox v Consolidated Gas Co. (1909) 212 U.S. 19, 48-49.

⁷⁰ http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html (March 21, 2005).

⁷¹ http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html (March 21, 2005).

4.9 Criticism 3 - Is there an incentive to over-invest under the SCA?

A common criticism of ROR regulation is that it encourages over-investment. Even if it might be a valid criticism of ROR regulation generally, it is not a valid criticism of the SCA in particular, precisely because the SCA contains enough safeguards against over-investment by HEC.

Government scrutiny

For new generation facilities, HEC prepares a least-cost plan containing the optimum size and mix of new units, subject to the environmental requirements. For new transmission facilities, HEC also prepares a least-cost plan, subject to constraints due to the size and location of sites, choice of cable routes, etc.

Under the SCA, HEC and the Government's regulating bureau jointly conduct a financial review in which they agree to a 5-year Financial Plan. This plan includes both the generation and transmission expansion plans referred to above. It also includes details of the pattern of demand and electricity sales, revenue forecasts, capital expenditure, the amount of new funds to be raised as equity, the amount of retained earnings to be invested and how acquisition of new assets is to be financed. The final Financial Plan has to be approved by the Executive Council of the Government.

Upon approval, HEC can then invest in accordance with the plan. Implementation of investment proposals is via competitive, open and fair international tendering processes for equipment and civil contracts.

This 5-year plan may be subject to changes, as a new Financial Plan must be prepared if certain events occur within the existing 5-year period, including when major additions are made to HEC's generation, transmission and distribution system or major variations to the system would result in significant capital investments and increases to tariffs.

Hence, the Government has advance notice of new investment and the opportunity to verify the need for that investment. Ultimately, if the Government considers the investment imprudent, it can reject the inclusion of the investment in the Financial Plan. Finally, the Government annually audits HEC's capital expenditures to ensure that the Plan is executed properly.

This system includes checks and balances such as regulatory review, government approval, competitive procurement, and audits similar to investment reviews in other jurisdictions such as North America.

Excess capacity adjustment

The excess capacity adjustment in the SCA described at the beginning of this section is a stringent mechanism stipulated by the Government on the power companies for the construction of new generating units and is a strong disincentive against over-investment. Even though the Government might agree in principle that a new power station for, say, six generating units is to be built to meet future demand, the addition of each unit to this new power station must receive the Government's approval individually. The approval procedure is as follows:

- Before HEC can place an order to buy the equipment for building a new unit which takes, say, 3 years to complete, HEC has to justify the need for this unit in 3 years' time based on its load forecast.
- The Government will verify this need for capacity addition by checking HEC's load forecast, with the aid of Government internal economists and external consultants.
- Even if the Government agreed with HEC on the load forecast and gave official approval to HEC to build a particular unit, HEC is still subject to the penalty as described above if the demand for electricity does not warrant the need for the unit three years later when the unit is built. This is true even if the shortfall in demand is due to factors outside HEC's control, e.g. the SARS epidemic.
- This is a severe ex post penalty that can be imposed by the Government after the completion of the plant which has received prior approval from the Government for its construction. Again this sort of penalty is rare in other regimes in North America, the U.K. or Australia.

This adjustment mechanism was introduced in 1999. HEC has shown that it works to the consumers' benefit by deferring the commissioning of a new generating unit twice in response to the sluggish load growth caused by the slowing-down of Hong Kong's economy in the past few years.

4.10 Criticism 4 - Has there been over-investment?

There are many claims that HEC and CLP have over-invested in generation capacity. To test the validity of these claims, one needs to consider whether the reserve margins used in Hong Kong are reasonable and then consider the generation investment against those reserve margins.

Are Hong Kong's reserve margins reasonable?

HEC's primary generation planning criterion for generation is the equivalent of 2.5 hours per year of loss of load probability (LOLP).⁷² It is reasonable by the North American industry standard, which has been confirmed by the independent U.S. consultants employed by the Government in reviewing HEC's Financial Plans in the past.

For a small system like that of HEC, this planning criterion translates to a reserve margin of about 25%, which is the safety margin of installed generation capacity exceeding peak demand to guard against any unforeseen breakdowns of generation plants.

⁷² Hong Kong Government. "Interconnection and Competition in the Hong Kong Electricity Supply Sector" (1999).

Comparison of generation capacity against reserve margins

One of the claims is that instead of building new generation capacity at Lamma Island, HEC could have accessed the excess capacity of CLP through greater interconnection. Increased interconnection is discussed in section 6.

However, it must be remembered that increased interconnection would be a temporary solution. Even critics acknowledge that *“there is little doubt that with future growth in peak demand, reserve plant margins [of CLP] will decline towards 25%.”*⁷³

The 25% threshold is in fact a minimum, not a cap. There will inevitably be times when the reserve margins will be significantly in excess of this threshold:

- The lead times to install new generation are long, implying that the investment decision is being taken well in advance of when the capacity is expected to be required. Projecting future demand is not an exact science. To the extent that there has been capacity in excess of the threshold, this can be attributed to demand growth which was lower than expected due to the 1997 Asian financial crisis and the well-documented move of the manufacturing industry from Hong Kong to Mainland China.
- The installation of new capacity will often involve a “step change”. That is, capacity may well be in excess of the reserve margin threshold when a new plant is first commissioned. However, this will decline over time. One reason for this is that, from a long-term view, it may be more efficient to install new capacity of a larger size to take into account longer-term growth than to add capacity in small increments.

One of the Australian Productivity Commission’s criticisms of gas regulation in Australia is that it placed a greater emphasis on incremental expansion. It distorted investment by placing greater reliance than otherwise on expanding capacity incrementally to meet demand growth as it arises, rather than building a larger pipeline initially based on forecasts of realisable demand.⁷⁴ This is not an efficient outcome for society.

4.11 Possible options to address the criticisms of the SCA

To address the criticisms of the current SCA, the Consultation Paper considers various options for regulating the power companies’ return on investment with respect to the following issues:

- determination of the rate base - the current return on assets (ROA) approach versus return on equity (ROE) approach (discussed in section 4.12);

⁷³ Wilkinson, A and Hopkinson, L, *“Is HK’s energy framework fair”*, CLSA Emerging Markets and Civic Exchange (March 2003) p 29.

⁷⁴ Productivity Commission, *“Review of the Gas Access Regime”* Report no 31 (2004) Canberra, pp 107, 135-9.

- determination of the permitted rate of return – comparing returns obtained from investments in other utilities (benchmarking) versus cost of capital approach (also known as weight average cost of capital or WACC approach) (discussed in section 4.13); and
- treatment of the Development Fund (discussed in section 4.14).

Another issue related to the setting of regulatory review period is considered in section 9.4.

4.12 Rate Base - ROA versus ROE approach

The permitted return under the current SCA is calculated by applying the permitted rate of return on HEC's average net fixed assets (that is, return on assets or ROA approach). Another basic approach is to adopt the return on equity (ROE) approach. Under the ROE approach, the rate base would comprise the amount of shareholders' funds (i.e. equity) rather than the actual assets used to provide electricity-related services. The ROA approach is more widely accepted. It is adopted by regulators in the U.K., Australia, New Zealand and Ireland and is applied in regulation for, in addition to the power industry, various kinds of utilities including airports, gas transmission and distribution, rail, telecommunications and water.

HEC queries the benefits of the alternative ROE approach:

- There is no logical reason to exclude debt financed assets nor is there any need for HEC to inject further equity.
- It does not encourage an efficient capital structure as it would incentivize HEC to use more expensive equity capital to fund investment and does not address the perceived incentive to over-invest at all.

Why exclude debt-financed assets?

The ROA approach is logical because it compensates the utility for all the assets which are used in the provision of public services (irrespective of how they are financed). There is no logical reason to tie returns to the amount of equity which shareholders decide to invest.

Encourages an inefficient capital structure

Debt capital is generally cheaper than equity. However, total average financing costs decline with increased debt financing only up to a point, beyond which the costs start to rise. This is why very few companies are 100% externally debt financed.⁷⁵ As noted by the South Australian energy regulator in its review on return on assets:

⁷⁵ Morin, R.A. (1994) *Regulatory Finance: Utilities' Cost of Capital*, Arlington, Public Utilities Reports, Inc (Chapter 17).

“Although an increase in gearing will imply the use of more (cheap) debt finance, the risks borne by equity providers - and hence the returns required - also rises with the level of gearing.”⁷⁶

Changing to an ROE approach would in general incentivize a moving away from an optimal debt/equity mix by replacing debt financing with more expensive shareholder's funds. The Government itself acknowledges that this approach would lead to an under-utilisation of debt capital.⁷⁷

Finally, moving to an ROE approach makes no difference to the perceived problem of over-investment. To the extent that the authorized return, whether ROA or ROE, is higher than the cost of capital, there can be a risk of over-investment. But this risk is mitigated via regulatory review and disallowance, as is currently done under the SCA.

4.13 Determination of the permitted rate of return - comparing returns from other investments (benchmarking) versus cost of capital approach (WACC)

The Consultation Paper defines the cost of capital approach as a systematic analysis of the costs of equity and the cost of debt of the relevant company. This WACC approach is used in the U.K. and Australia network businesses.

WACC is a calculation of a firm's cost of capital by weighting each category of capital in that proportion reflected in its capital structure or an optimal capital structure which (ignoring the effect of taxes) can be summarized as:

$$WACC = (R_e \times E/V) + (R_d \times D/V)$$

where R_e and R_d is the costs of equity and debt respectively and E, D and V are the values of equity, debt and total assets respectively.

The Consultation Paper suggests that this approach is more objective and transparent. However, in applying the WACC approach, there are a number of uncertainties. It is not simply a mechanical exercise which leads to a precise result:

“... any estimate of the cost of capital is subject to a degree of statistical uncertainty. The combination of its importance and the degree of statistical uncertainty have made the estimate of the cost of capital one of the more controversial matters faced by other regulators.”⁷⁸

For example, a particularly contentious issue is the cost of equity and how to determine it. There are a number of methodologies commonly used including the capital asset pricing model (CAPM), dividend growth model (DGM), price/earnings ratio and arbitrage pricing theory.

⁷⁶ Essential Services Commission of South Australia, “Electricity Distribution Price Review: Return on Assets Discussion Paper” (August 2003) pp 37-8. Available at www.escosa.sa.gov.au.

⁷⁷ Consultation Paper, p 14.

⁷⁸ Essential Services Commission of South Australia, “Electricity Distribution Price Review: Return on Assets Discussion Paper” (August 2003) p 22. Available at www.escosa.sa.gov.au.

CAPM is widely used in the U.K. and Australia. Its basic steps are to:

- determine what is the market return on risk-free assets (usually government bonds) of appropriate tenor;
- determine what is the market risk premium, that is the extra return paid for owning the risky market portfolio (which represents the market as a whole) rather than the risk-free assets which have more predictable return; in this step, it is usually necessary to determine what an investor may expect to earn from the market portfolio;
- determine what is the risk level of the utility relative to the market as a whole, which is measured by the beta coefficient; and
- calculate the utility's cost of equity based on the results from the above steps using the formula prescribed by the model.

As can be seen from even this very simple explanation, many of the components such as the risk free rate of return and beta coefficient are subjective.

The WACC approach does provide a defined process for making this decision. However, it tends to focus the debate on subsidiary issues rather than the overall objective - *“ensuring investors receive a return that is sufficient to motivate the investment and attract the capital away from alternative investments.”*⁷⁹

The benefit of a more defined process must be weighed against a number of other drawbacks.

Additional cost

The nature of the WACC components is such that it is inevitable that both the utilities and the regulators will require independent consultants to advise on the various issues. These costs are significant.

For example, the Australian Productivity Commission estimated that regulatory reviews by energy regulators in Australia cost in the order of A\$27 million in 2002 alone. This does not include the greater costs expended by the utilities in preparing the submissions in the first place.

In a particularly contentious regulatory pricing decision on a major gas pipeline using the WACC approach, Epic Energy (the pipeline owner) noted that its costs from the process included the costs of preparing over 100 formal submissions to the regulator, A\$2.5 million in hiring consultants, A\$2.5 million in payments of the regulator's costs (excluding the A\$800,000 that the regulator incurred in participating in a legal challenge of the draft decision). It could not quantify the time spent by management on regulatory matters, but noted *“the consequences of a lost development opportunity would be significant.”*⁸⁰

⁷⁹ Essential Services Commission of South Australia; *“Electricity Distribution Price Review: Return on Assets Discussion Paper”* (August 2003) p 21. Available at www.escosa.sa.gov.au.

⁸⁰ Productivity Commission, *“Review of the Gas Access Regime”* Report no 31 (2004) Canberra, pp 107, 145-6.

Protracted negotiations

The Government is correct in identifying that the WACC approach might entail a more protracted negotiation process.⁸¹ This is consistent with international experience which also shows that the complexity of the WACC approach often gives rise to legal challenges by the utilities.

The following table is a summary of the most recent regulatory decisions in Australian gas pipeline pricing reviews prepared by the Australian Productivity Commission.⁸² Note that this does not include the time required by the utility to prepare the initial regulatory submission or subsequent appeals.

For example:

- GasNet successfully appealed the regulator's decision on the Victorian transmission system to a review tribunal which meant a final resolution took some two years.
- Similarly, Epic Energy successfully appealed the regulator's decision on the Moomba to Adelaide system to the review tribunal which meant that a final resolution took almost 5 years.
- There is still no resolution on the regulatory pricing for the Moomba to Sydney system after more than five years. EAPL successfully appealed to a review tribunal in July 2004 but the regulator has appealed the Tribunal decision to the Federal Court.

Pipeline	State or Territory	Time for approval of initial access arrangement
Transmission pipelines/systems		
Victorian transmission system	VIC	1 year 1 month
Moomba-Adelaide	SA	3 years 3 months
Moomba-Sydney system	SA/NSW	4 years 7 months
Ballera-Mount Isa (Carpentaria Gas Pipeline)	QLD	1 year 10 months
Ballera-Wallumbilla	QLD	1 year 10 months
Wallumbilla (Roma)-Brisbane	QLD	1 year 10 months
Wallumbilla-Rockhampton (QLD Gas Pipeline)	QLD	1 year 3 months
Marsden-Dubbo (Central West Pipeline)	NSW	1 year 9 months
Amadeus Basin-Darwin	NT	3 years 9 months
Dampier-Bunbury	WA	4 years

⁸¹ Consultation Paper, p 15.

⁸² Productivity Commission, "Review of the Gas Access Regime" Report no 31 (2004) Canberra, p 150.

Pipeline	State or Territory	Time for approval of initial access arrangement
Tubridgi	WA	2 years
Parmelia Pipeline	WA	1 year 7 months
Goldfields Gas Pipeline	WA	4 years 6 months
Distribution Networks		
Multinet Gas, Westar Energy and Envestra systems	VIC	1 year 1 month
Envestra SA distribution	SA	4 years 2 months
Albury Gas Company	NSW	1 year 7 months
Wagga Wagga (Great Southern Energy)	NSW	1 year 6 months
AGL NSW distribution	NSW	10 months
Canberra	ACT	2 years
Queensland	QLD	1 year 2 months
Alinta Gas distribution	WA	1 year 1 month

Appropriateness of the WACC approach to Hong Kong

It is empirically difficult to implement WACC approach in the Hong Kong context. This discussion will focus on CAPM and DGM, the two most commonly used model to estimate cost of equity (COE) in the WACC formula.⁸³

The problem with CAPM is that one must estimate the model's coefficients before one can compute the COE. Empirical estimation requires the data on a company's stock returns, the market stock returns, and a risk-free interest rate. This kind of data must necessarily be historic since no one can accurately project stock return data.

Suppose one estimates the COE of HEC with CAPM using historic data collected during the last 10 years in which the SCA was in effect (in real life one can only use the stock prices of Hongkong Electric Holdings (HEH) rather than HEC since HEC is not publicly listed and this will increase the inaccuracy of estimation). The historic returns of HEH stock reflect HEC's earnings, the bulk of which came from the steady SCA-related earnings. The beta estimate is likely to be smaller, reflecting HEH stock's lower risk relative to the stock market in general. But if HEC's future earnings become increasingly uncertain due to regulatory risk, its future stock returns would also become more volatile, leading to a larger beta estimate. Hence, the CAPM results based on historic data are biased, yielding an artificially low COE estimate. Thus, while CAPM is commonly used model, it is not empirically applicable to Hong Kong because it will always yield a COE

⁸³ Brealey, R.A. and S.C. Myers. 1996. *Principles of Corporate Finance*. New York: McGraw Hill Chapter 9.

estimate that is too low and unreflective of the post-2008 uncertainties due to the changing regulatory regime.

Empirical versions of the dividend growth model make simplifying assumptions like constant dividend growth rate and fixed dividend pay-out ratio.⁸⁴ Both assumptions are dubious because if the post-2008 permitted rate of return is much lower than the current one, a power company is unlikely to maintain a constant dividend growth rate or a fixed pay-out ratio.

4.14 Treatment of the Development Fund

The Development Fund is extremely important as explained at the beginning of this section and should be retained. It is held for the ultimate benefit of consumers and helps to stabilize tariffs in that excess Development Funds are returned to customers through tariff reductions or rebates.

The criticism of the Development Fund is that utilities may be inclined to build up large balances.

First, HEC has not built up large balances in its Development Fund. As shown in Figure 12, HEC's Development Fund was not excessively high in the past years and has been at zero balance since 2003.

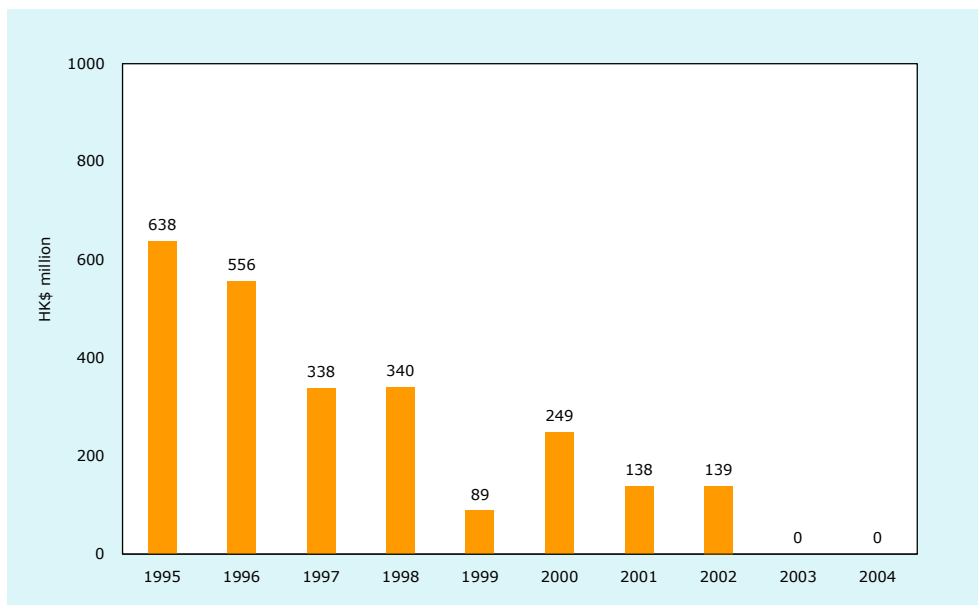


Figure 12: Development Fund Balance of HEC

⁸⁴ Brealey, R.A. and S.C. Myers. 1996. *Principles of Corporate Finance*. New York: McGraw Hill, Chapter 4.

Second, while it is true that CLP did have a large balance at one stage, it was agreed in the 2003 SCA Interim Review to cap the Development Fund at 12.5% of a company's annual local sales. Any amount over this cap will automatically be rebated to customers immediately in the next year in the form of a one-off rebate or tariff reduction.

Accordingly, this new mechanism and the existing establishment of the Rate Reduction Reserve, to which 8% of the Development Fund balance is to be paid from the permitted return, removes any incentive for or ability of the utilities to build up large balances.

5 Performance based regulation (PBR) and regulating tariff

- The main advantage of PBR is that it is seen to incentivize a utility to aggressively cut expenditure since it allows the utility to keep a share of the savings. However, international experience has shown that it may actually incentivize utilities to under-spend by cutting back necessary maintenance and upgrades. That is, the utility keeps the savings at the expense of supply reliability.
- Further, PBR is forward looking so if the regulator underestimates the expenditure required or simply “gets it wrong”, the utility will not “overspend” its allowance, even if such expenditure is necessary.
- PBR is not a perfect form of regulation. It brings with it a host of other issues, including difficulties in determining the “X” productivity factor and initial price or revenue cap, distortions to spending patterns arising from gaming of the sharing mechanism and an incentive to increase electricity sales volume at the expense of the environment.
- The Government considers that the shorter regulatory periods introduce more flexibility. However, HEC questions this. In fact, the price or revenue cap, once set for the regulatory period, cannot be changed within the period.
- One of the oft-cited advantages of PBR is that it requires less regulatory oversight than ROR regulation. International experience shows this to be a questionable claim and, in any case, is certainly not true when compared to the existing SCA.
- The CPI - X mechanism is not appropriate for Hong Kong. The CPI factor cannot be relied upon as a good indicator to reflect the prevailing local economic situation. In addition, 90% of HEC’s cost inputs are not related to the local inflation rate. A CPI-following tariff would make tariffs unreflective of costs and increase HEC’s risks. In any case, HEC’s tariffs have increased below inflation since 1983, the first full operating year of Lamma Power Station.
- Greater transparency can be achieved in the tariff setting process without resorting to PBR. HEC has already agreed to this in the 2003 SCA Interim Review and is willing to work with the Government further on this issue, subject to preserving HEC’s legitimate interest in commercially sensitive information.
- The option of abolishing the Fuel Clause Account mechanism is not practical. Fuel costs are not in HEC’s control. HEC would need a higher rate of return if asked to internalize this risk.

5.1 What are the possible modifications to the SCA?

In section 4, possible modifications to the permitted rate of return and rate base under the SCA were considered. This section considers other possible modifications to the SCA in the Consultation Paper being:

- performance based regulation and linking the tariff to economic indicators;
- the introduction of performance standards;
- increasing the transparency for the current tariff setting process; and
- abolishment of the Fuel Clause Account mechanism.

5.2 What is PBR?

Overview

The current SCA uses a form of rate of return (ROR) regulation which is common in the U.S. One criticism of the traditional ROR regulation is that it gives utilities little financial incentive to proactively reduce operating costs.

An alternative form of regulation is PBR (sometimes called incentive-based regulation) which is designed to address this issue. PBR is distinguished from ROR regulation in that it caps a utility's prices or revenue during the regulatory period. One of its main advantages over ROR regulation is that it is designed to give utilities an incentive to cut costs. It does this by placing the utility in a position of being a price taker such that it can only increase profits by reducing costs.

Generally, PBR is linked with a CPI - X mechanism which adjusts the price or revenue cap on an annual basis.

The CPI-X mechanism

The approach discussed in the Consultation Paper is the use of a price cap or revenue cap using a CPI - X (or RPI - X) mechanism to adjust the price or revenue cap during the defined regulatory period. The CPI - X methodology was developed as part of the U.K. privatisations in the early 1990s. It is commonly used in the U.K. and Australia for regulation of network businesses.

In essence, at the beginning of the regulatory period (typically 3 to 5 years), an initial price cap or revenue cap would be determined to enable the utility to recover its costs and an appropriate rate of return on its rate base. The price or revenue cap would then be adjusted annually in accordance with a formula as follows:

$$P_t = P_{t-1} \times (1 + \text{CPI} - X) + Z \pm S$$

where:

P_t is the price or revenue cap for the particular year t ;

CPI is the annual percentage change in the consumer price index or some other form of inflation index;

- **X** is a productivity target being the level of efficiency which the utility is required to meet;
- **Z** is an ad hoc allowance under which the price or revenue cap can be adjusted to allow for pass-through of costs outside the utility's control (e.g. changes in taxes or government policies). Generally, a utility would have to obtain approval from the regulator before a cost would be allowed in the Z factor. If too many Z factor allowances are provided for then the regime starts to resemble ROR regulation; and
- **S** is a service or performance factor which is often incorporated into the PBR mechanism. The utility may be rewarded or penalized depending on whether it meets certain defined service or performance standards.

Assuming the X factor is set at a positive number, the prices or revenues will increase by less than inflation during the regulatory period. The X factor forces the utility to be more efficient and customers share in the efficiency gains or automatically get the benefit of the efficiency gain which the regulator believes the utility should have been able to achieve. If the utility can reduce costs beyond the required level of efficiency, then it keeps the gain until at least the end of the regulatory period.

Where a price cap is used, the utility can earn additional revenue by increasing sales volumes as the cap applies to each sale unit rather than total sales.

5.3 Does PBR have benefits as compared to the SCA?

In the context of the SCA, the Government identifies the following benefits of PBR and the CPI - X mechanism:

- it could provide greater incentive for utilities to cut costs and operate efficiently;
- it could bring tariffs more in line with the economic situation;
- the shorter regulatory review period would provide greater flexibility in introducing changes.

Incentive to cut costs

There is no doubt that utilities have much greater incentives to aggressively cut costs under this form of regulation. The utility is set an allowance and is able to determine exactly how - or whether - it will spend the money, in response to the incentive that it can keep any allowance not used at least during the regulatory period.

However, this stated advantage can also be a major disadvantage. The incentive to cut cost may be so great and the allowances so strict that it actually leads to under-investment. In the former case, there have been suggestions that utilities may deliberately under-spend (e.g. by cutting maintenance and investment) and keep the proceeds as profit. In the latter case, if allowances are not high enough, utilities are penalized for “overspending” in capital; even though such expenditure may be prudent, even necessary, to maintain the system.

The following examples from the U.K. and Australia relate to distribution systems regulated under CPI-X price cap mechanism.

In its March 2004 policy document relating to electricity distribution price controls, the U.K. regulator, Ofgem noted:

*“... most companies have spent less than allowed. In aggregate the price control “allowed” for around £5.5 billion of net investment over the period 2000 - 2005 and projected expenditure by the companies is around £5.3 billion - i.e. companies are forecasting to under-spend the allowances made by Ofgem. The under-spend to date, for the 3 years ending March 2003, is around £300m. Arguably therefore if higher investment is needed in the future (as the companies are indicating), this will not be achieved solely by Ofgem giving companies even higher allowances or revenues. It is a valid question whether the rewards that companies receive for reducing their investment costs are too great.”*⁸⁵

Ofgem has recognized that in the future capital overspends will become more likely and has therefore developed a test to allow prudent capital overspends to be included in the rate base.

After widespread blackouts in Queensland in 2004, the Queensland Government ordered an independent panel to conduct an inquiry into the status of Queensland distribution systems. This panel found that reliability of supply had deteriorated over the 2001-04 period, primarily due to inadequate investment.

*“The Panel believes that the current regulatory regime has resulted in [one of the Queensland distributors] ... deferring necessary “additional” capital expenditure because it is not sufficiently financially rewarding...”*⁸⁶

*It is accepted that achieving operating and maintenance expenditure efficiency improvements is one of the prime objectives of this form of regulatory control. However, the Panel believes that there is a big difference between under-spending due to efficiency improvements and under-spending due to not carrying out necessary maintenance activities.”*⁸⁷

In both cases, further changes to the price controls were recommended to deal with these issues. As discussed previously, the costs of under-investment and failed electricity systems are much greater than a small amount of over-

⁸⁵ Ofgem, “Electricity Distribution Price Control Review, Policy Document” (March 2004) p 2-3. Available at www.ofgem.gov.uk.

⁸⁶ “Electricity Distribution and Service Delivery for the 21st Century”, p 51. Available at www.energy.qld.gov.au.

⁸⁷ “Electricity Distribution and Service Delivery for the 21st Century”, p 54. Available at www.energy.qld.gov.au.

investment. PBR therefore needs to be implemented carefully to get the incentives right.

Bring tariffs in line with economic conditions

Hong Kong has a very open and volatile economy which is subject to a host of external factors (e.g. international oil prices). A year with high inflation may not necessarily mean a vibrant economy. As such, the CPI factor cannot be relied upon as a good indicator of the prevailing local economic situation. When the inflation is high but the economy is poor (e.g. in years 1982 and 1989), the increase in tariff due to the linkage with CPI will further aggravate the deteriorating living standard for consumers. If the goal is to contain tariffs by CPI for the benefit of customers, then it is certainly unachievable.

In addition, as most of the factors of electricity production in Hong Kong are imported, the costs of these inputs have no link to Hong Kong's consumer price movements. HEC has determined that about 90% of its operating costs (e.g. fuel, tax, depreciation) are not related to the local inflation rate. Linking HEC's tariffs to CPI will make them lack cost reflectivity.

It may be possible to construct some other form of index which more accurately measures changes to HEC's input costs. However, it will lack the credibility and timeliness of generally accepted and available inflation indexes. It would also add to the complexity and cost of the regime if the parties have to agree and then calculate an industry specific inflation index on an on-going basis.

HEC would also like to point out that increases in tariffs have in fact been less than CPI increases since 1983, the first full operating year of Lamma Power Station, as shown in the Figure 13.

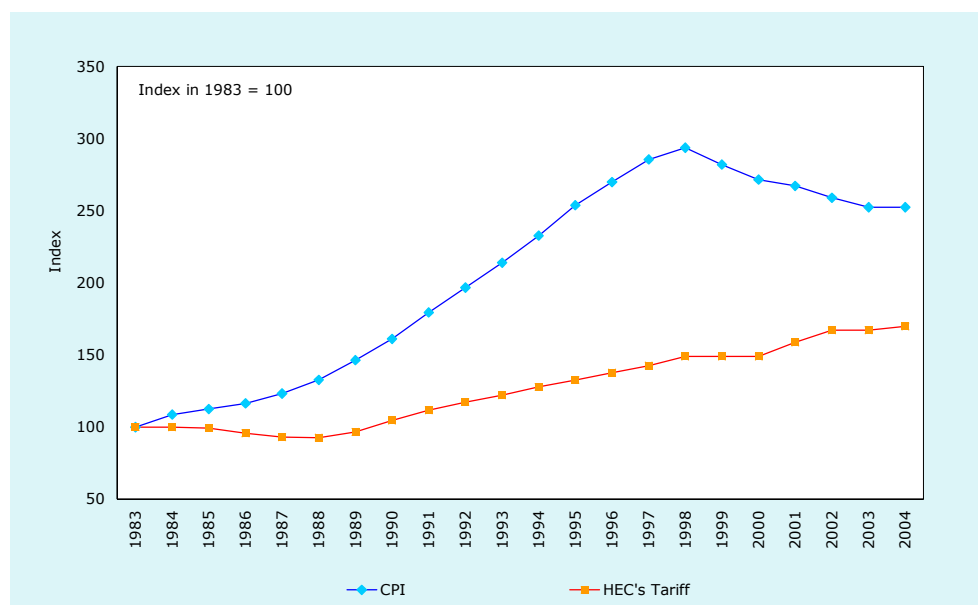


Figure 13: Comparison of HEC's tariff to the Consumer Price Index (1983-2004) ⁸⁸

⁸⁸ Census & Statistics Department, HKSAR Government and Hongkong Electric Holdings Ltd. Annual Reports.

More flexibility by using a shorter regulatory period?

As recognized by the Government such flexibility is at the cost of investment certainty and the risk of discouraging investment.⁸⁹ This is an issue explored in section 9.

Further, flexibility has little to do with indexing. If anything, fixed revenue or price controls which are set for the regulatory period and linked to indexes preclude flexibility. As noted by the South African National Electricity Regulator:

*“Because the [PBR] methodology is a forward looking method, it is full of uncertainties and an error at the beginning of the [PBR] period may be very detrimental for the industry as it is very difficult to make adjustments to the [PBR] components during the [PBR] period. In an environment of dynamic change and restructuring, it would be difficult for the Regulator to change some components during the set period.”*⁹⁰

5.4 What are the disadvantages of PBR?

The Government identifies the following shortcomings:

- it would require other measures to ensure that the objective of maintaining safe and reliable supply is not compromised - this relates to the under-investment problem discussed above;
- it could give rise to increased business risk and discourage investment; and
- it would require more administrative scrutiny and bring about higher costs (discussed further below).

There are also other disadvantages which have been noticed from international experience.

X factor issues

The value of the X factor is difficult to calculate and can be contentious. There is no guidance or formula of determining it.

Simply setting the X factor based on past performance raises issues. *“If the regulator uses the past performance of the firm, such as profitability, as a guide to setting the X factor then management incentives will be undermined and the price cap will take on the characteristics of rate of return regulation. This effect will be more pronounced if reviews of the X factor are undertaken at short intervals.”*⁹¹

⁸⁹ Consultation Paper, p 20.

⁹⁰ National Electricity Regulator, “Regulatory Framework for the Economic Regulation of the Electricity Supply Industry (ESI) of South Africa (A Discussion Document)” (29 July 2002) p 8.

⁹¹ “Price Regulation of Utilities”, Treasury Economic Roundup (Feb 1999) p 64. Available at www.treasury.gov.au.

Further, at some stage productivity gains may be exhausted and costs of doing business increase beyond inflation such that the X factor is set at a negative number. Tariffs will then increase at a rate higher than inflation.

Setting price or revenue caps

Similarly, setting the initial price cap or revenue cap can be difficult. *“Some descriptions of incentive regulation give the impression that it consists entirely of a price cap formula, set without any need to consider a company’s actual costs. In practice, it is only possible to define a successful price cap formula once the regulated companies’ costs are well defined.”*⁹²

In Australia, a “building block” approach is used to determine the revenue required so as to set the price or revenue cap. This involves detailed scrutiny of individual cost areas of the utility and benchmarking. In fact, it starts to approximate ROR regulation.

Getting it wrong

Unlike the SCA, the regulatory periods for PBR must be shorter because it involves anticipating the revenue or prices required by the utility for the future period. No regulator can operate with perfect foresight. Windfall losses or gains may occur because of unanticipated economic conditions, weather, fluctuating demand or other such factors.

In the 2004 panel inquiry into Queensland’s distribution system failures referred to above, one of the reasons for the failures was high population growth leading to much greater than expected demand. Instead of spending its allowances for capital expenditure on system maintenance and upgrades, the distributor used the allowance to fund more connections to the system. The additional load on the system exacerbated the lack of investment.

Similarly, in the U.K. it was considered that the price caps set at the time of privatisation were too generous. This led to much political and consumer dissatisfaction with the CPI - X mechanism and concerns over issues of fairness and equity. The regulator in March 1995 then set much more severe price caps in the second regulatory cycle which led investors to have concerns that the new regulatory regime lacked commitment.⁹³

As noted above, it is difficult to make changes in the middle of the regulatory period. *“Revising price caps before the end of the regulatory period - or even after the regulatory period has finished - to take away unexpected profits undermines these incentives [to reduce costs] and may even offer worse incentives for efficiency than a traditional regime of cost pass-through.”*⁹⁴

⁹² Kraus, M, “Germany’s Push for an Incentive Regulation in the Energy Market”, NERA Energy Regulation Insights (March 2005) p 4. Available at www.nera.com.

⁹³ For a discussion on the U.K. experience, see the Electricity Industry Association’s “Electricity Restructuring and Privatization in the United Kingdom.” Available at www.eia.doe.gov.

⁹⁴ Kraus, M, “Germany’s Push for an Incentive Regulation in the Energy Market”, NERA Energy Regulation Insights (March 2005) p 4. Available at www.nera.com.

Distortions on timing and investment

One of the side effects of PBR and the CPI - X mechanism is that it makes utilities focus on achieving cost savings at the start of the regulatory period rather than at the end. These savings are generally only retained by the utility until the end of the regulatory period; thereafter, they are transferred to the customers in the form of price cuts. So the earlier the savings, the more the company benefits. Conversely, savings which could be made at the end of the period may be concealed and deferred to the next period.

Regulators have developed mechanisms to remove these distortions involving “glide path” or “carry over” mechanisms where the benefits to the utility of cost savings made during the regulatory period can carry over into the next regulatory period. However, these mechanisms add a further layer of complexity to the regulatory regime.

A similar issue arises on capital investment. It is not always clear whether utilities will keep the full benefits of unexpected reductions in capital expenditure. Often only actual capital expenditure goes into the rate base rather than planned capital expenditure. Further, it is better to make capital investments at the end of the regulatory period when they can enter into the rate base at the beginning of the next period and start earning a return immediately.

*This raises a related issue - “[t]he fact that companies often reap more benefit from improvements in operating costs than from greater efficiency in capital spending means that there is no incentive to make efficient trade-offs between the two. This causes particular problems in capital-intensive industries with long-lived assets, where the optimal approach is often to raise spending on maintenance to delay the need for renewal.”*⁹⁵

Price cap gives no incentive for demand side management

Price cap incentivizes the utility to increase electricity sales as it allows the utility to earn more profits. Thus, it does not encourage demand side management unless special incentives are included - but this adds to the complexity of the regime.

More regulatory scrutiny and expense

One of the benefits usually cited for PBR is that it is more “light-handed” when compared to the more “intrusive” ROR regulation. This is because prices or revenues are set for the fixed regulatory period and, in theory, regulators do not need to scrutinize expenditure or investment decisions to determine whether they are prudent.

It is doubtful whether this is entirely true even when compared to the traditional ROR regulation. Management and regulators have to devote a significant amount of time to the regulatory resets, not to mention annual tariff changes and mid-period reviews or requests for pass-throughs. As admitted by one U.K. regulatory manager:

⁹⁵ Dobbs, R and Elson, M, “*Regulating Utilities: Have we got the formula right?*”, The McKinsey Quarterly (1999) Number 1. Available at www.mckinseyquarterly.com.

*“For three years out of five, the management team is distracted by the upcoming periodic review and the implications of their actions on the outcome.”*⁹⁶

International experience indicates the claim that PBR requires less regulatory scrutiny is questionable and, in any case, is certainly not true when compared to the existing SCA.

5.5 Do the benefits outweigh the costs and risks?

HEC acknowledges that PBR gives greater incentives to cut costs than the traditional ROR regulation. However, it is complex and introduces its own set of problems and distorting incentives which are still being grappled within jurisdictions which have had this form of regulation for some time. Of particular concern is that in its goal to achieve cost reductions, it may do so at the cost of service quality and reliability.

It is also not necessarily correct to assert that PBR can provide better incentives for economic efficiency than all forms of ROR regulation. The practical distinction between ROR regulation and PBR is blurred and, as discussed above, PBR with many Z factors can resemble ROR regulation. Further, ROR regulation can and does have strong incentives for cost cutting and investment efficiency due to prudence review and disallowance, as under the SCA’s current provisions for financial review, auditing review and excess capacity adjustment.

The Consultation Paper specifically refers to PBR with a CPI - X mechanism in the U.K. and Australian context. However, it is only used in those countries for regulation of network businesses, not integrated utilities. In the 1990s in the U.S., which has over 100 regulated investor-owned utilities, only three small integrated electric utilities (Central Maine Power, Rochester Gas & Electric and Narragansett) were subject to a CPI-indexed cap.⁹⁷ This form of regulation is not the norm for regulating network companies in OECD countries. Only 10 of the 30 OECD countries presently use CPI-indexed caps.⁹⁸

Thus, it is important that PBR should not be seen as an inherently better model than the SCA. This is particularly so when one of its key features, the CPI - X mechanism, is not automatically applicable to HEC given its input costs do not track generally accepted measures of inflation.

⁹⁶ Quoted in Dobbs, R and Elson, M, “*Regulating Utilities: Have we got the formula right?*”, The McKinsey Quarterly (1999) Number 1. Available at www.mckinseyquarterly.com.

⁹⁷ Schmidt, M. R. (2000) *Performance-Based Ratemaking: Theory and Practice*, Arlington, Public Utilities Reports Inc; Biewald, B., T. Woolf, P. Chernick, S. Geller, and J. Oppenheim (1997) *Performance-Based Regulation in a Restructured Electric Industry*, Columbus, National Association of Regulatory Utility Commissioners.

⁹⁸ Al-Sunaidy, A. and Green, R, (2005) “*Electricity deregulation in OECD countries*,” *Energy [forthcoming from EEEI]*, Table 2.

5.6 Performance standards (return based on performance)

The Consultation Paper suggests that incentives could be introduced to encourage improvements in operating efficiency and service performance (e.g. to meet or exceed performance standards and targets).⁹⁹

The Government correctly points out that this approach will entail additional resources and costs in determining performance targets, and monitoring and assessing actual performance against the targets.¹⁰⁰

As noted above, such service standards are often included in PBR as an “S” factor such that utilities are rewarded or penalized if they over- or under-perform against the standards. Performance standards are critical to PBR to ensure that utilities do not reduce expenditure by lowering performance. If PBR is not introduced, then HEC questions whether such standards are really necessary given the cost.

HEC has already demonstrated a commitment to service and performance quality. In addition to its high levels of supply reliability, its standard of services also compares favourably to other international utilities. For example, HEC’s performance has been able to meet or surpass the stringent customer service standards set for various areas of customer services. To name a few, HEC accomplished the following in 2004:

- Meter installation after satisfactory inspection – immediate.
- Reconnection of supply after payment of outstanding charges – same day as payment is received.
- Average waiting time for telephone enquiry services by Customer Services Representatives and calls to Customers Emergency Services Centre – less than 9 seconds.
- Average arrival time to scene in urban areas in response to emergency calls – less than 28 minutes.
- Average time for supply restoration after interruption of supply – within 2 hours.

5.7 Increasing transparency of the existing tariff setting process

Under the existing tariff setting process, the tariff rate is set as part of the 5 yearly Financial Plan agreed with the Government to enable HEC to recover its permitted return and operating costs.

⁹⁹ Consultation Paper, p 17.

¹⁰⁰ Consultation Paper, p 17.

There is then a review with the Government's regulating bureau at the end of each year to consider the tariffs for the following year. If, for the next year, HEC requests an increase in its tariff which deviates significantly from that agreed in the 5 yearly Financial Plan, then approval from the Executive Council of the Government is required. If the deviation is too large, a new Financial Plan may need to be submitted to the Government and obtained final approval from the Executive Council. Accordingly, the Government has direct and continuing oversight over tariff changes.

However, one of the criticisms of the SCA is that the tariff setting process lacks transparency. The Consultation Paper suggests that an alternative to introducing the CPI – X mechanism might be to retain the existing tariff setting process but make more information publicly available.

In fact, this issue has already been addressed in the 2003 SCA Interim Review. HEC agreed to segregate and present cost data pertaining to generation and networks to the Government. It is true that HEC gives the Government commercially sensitive information as part of this process which is not made public. Hongkong Electric Holdings, the parent of HEC, is a listed company and the inappropriate disclosure of confidential information would lead to stock speculation.

HEC is not aware of any tariff-setting regime which does not allow a utility to specify at least some information as confidential. To do otherwise inhibits full disclosure between the regulator and the utility.

The Government notes that the disadvantages of this proposal are that the public may still not be satisfied by increased disclosure and such disclosure will increase the time required to complete the process. HEC agrees with these comments.

Nevertheless, HEC is willing to discuss further with the Government what additional information could be provided to assist public understanding of the process.

5.8 Fuel cost adjustments

Under the SCA, HEC maintains a Fuel Clause Account (FCA). This account records difference between the standard cost of fuel as agreed between HEC and the Government and the actual cost of fuel. The difference is passed on to consumers through rebates or surcharges.

Since all types of fuel (coal, gas and oil) for electricity generation used in Hong Kong are sourced from the global market, the power companies have virtually no control on their prices. It must be understood that the purpose of setting up the FCA is to merely formalize the fuel cost recovery process and increase its transparency. Even if PBR were introduced, it would be necessary for fuel costs to be a "Z" factor as it is a cost outside HEC's control.

The projected FCA rebates/surcharges have always been vetted and audited by the Government during the annual tariff review, the annual auditing review and the financial plan approval process.

The disadvantage of the FCA stated in the Consultation Paper that power companies might not have the incentive to ensure efficient fuel procurement is not correct. Despite the direct pass-through, fuel procurement efficiency is beneficial not only to the consumers but also to the power companies as they are under constant public pressure to minimize net tariffs paid by consumers. It is therefore to their advantage to keep the fuel cost as low as possible.

The FCA mechanism must be retained after 2008 to protect the power companies from risk exposure in fuel price fluctuation. Removal of the FCA will only lead power companies to ask for a higher required return as they will need to internalize fuel cost volatility.

6 Increased interconnection

- HEC agrees with the Government that interconnection capabilities to “full access” is not economically viable as major capital investment would be required to build the new interconnection and to reinforce the existing networks.
- HEC’s analysis shows that the costs of the new interconnection are higher than the benefits of deferring new generation.
- The characteristics of the Hong Kong market mean that the benefits from increased interconnection are minimal.
- The lack of diversity between the HEC and CLP systems reduces the benefits of reserve sharing provided by increased interconnection.
- Optimizing system resources by joint planning between the two power companies or by a central agency is neither practical nor cost effective due to the complex legal and commercial issues involved.
- Utilizing interconnection for regular power transfer brings with it greater risks in relation to supply reliability. Recent blackouts in the U.S., Europe and Australia have shown that single failure in one system can lead to cascading failures over the whole interconnected systems.

6.1 Existing arrangements

The transmission grids of HEC and CLP have been interconnected since 1981. Interconnection exists via submarine cables between Hong Kong Island and Kowloon. It is primarily used for emergency backup, sharing of reserve capacity and sharing of spinning reserve. The economic benefits have been significant and fully captured.

HEC currently develops its generation capacity plans independently. However, possible support from CLP via the existing interconnection has been taken into account in the planning to reduce the level of reserve capacity. As for generation of electricity, HEC currently dispatches its generation plants independently.

6.2 Issues and 'possible' options

One of the criticisms of the existing level of interconnection is that it is seen as a barrier to customer choice between the two power companies and to competition from external sources of supply. A technically feasible option as recommended by the Government's consultancy study in 2003 was to install a new interconnection consisting of two 400kV circuits, each of 700MW in capacity.

There are three operational considerations identified in the Consultation Paper in relation to increased interconnection:

- increasing interconnection capability to a "full access" level so that customers would have the choice of obtaining supply from either of the two existing power companies;
- utilizing the increased interconnection to enhance overall efficiency of the HEC and CLP systems;
- optimising system resources by increasing co-ordination between the two power companies or having central planning either jointly by the two power companies or by a central agency in developing the overall system plans.

6.3 Full access capability

Although increasing interconnection capability to "full access" may be technically possible it is clearly not economically viable.

As pointed out in the Consultation Paper:

- to allow customer choice, the interconnection as well as the networks of the two power systems would have to be enhanced;
- the power companies would need to develop substantial additional generation capacity to cater for supplying customers in both service areas;

- these significant upfront costs would be borne by all consumers while the perceived benefits would be uncertain and long in coming.¹⁰¹

Given these considerations, HEC agrees with the Government that “full access” interconnection is not currently a viable option for Hong Kong.

6.4 Enhancing system efficiency

Increased interconnection is seen as a means of:

- bringing about investment savings arising from deferring the need for new generation capacity and a reduction in running costs of generation put on-line to meet the spinning reserve requirement; and
- allowing one power company to increase power purchase from its interconnected counterpart to supply its customers if such a purchase is deemed to be more cost effective than its own generation. This is primarily a fuel cost saving, which is the largest proportion of variable costs.

However, HEC is of the view that there are a number of issues with increased interconnection:

- The costs of increased interconnection are higher than the benefits of deferring new generation.
- The characteristics of the Hong Kong market mean that these benefits from interconnection are minimal.

Costs

Major capital investment would be required to build the new interconnection and reinforce the two networks, but this could only reduce the overall reserve capacity of HEC and CLP marginally by deferring the need of new generation by about 2 years.

HEC has analysed this situation and found that the costs of interconnection are higher than the benefits of deferring new generation.

Reserve capacity

Interconnection can defer installation of new generation in two ways:

- the ability to transport electricity from a system with surplus generation to a system with a shortfall in generation. As this is equivalent to entering into a contract for supply from one system to another, this is termed a “contract capacity benefit”; and

¹⁰¹ Consultation Paper p 22.

- the ability of a bi-directional interconnection to provide reserve sharing between the interconnected regions. That is, each system can maintain less reserve because it can rely on the other. This is termed a “reserve sharing benefit”.

The contract capacity benefit in this case is low, since, as discussed in section 6.6, utilizing the interconnectors for contract capacity brings with it greater risks to supply reliability. To meet the supply reliability objective, HEC should develop its system plan with self-sufficient generation and should not rely on contract capacity from the interconnection.

The value of the reserve sharing benefit increases with the diversity between the interconnected systems. The likelihood of the reserves being available increases if each system has different patterns of electricity consumption, different timings of peak demand, different weather patterns, different fuels, different supply/demand situations, etc. For example, if the electricity demand in one area is at peak while that in another area of a possibly different time zone or different economic models is still in off-peak period and the power systems of the two areas are interconnected, then one system can support another system.

However, because of the geographic proximity, similar economic activity patterns and similar load profiles of the HEC and CLP systems, the peaks and troughs of the two systems generally occur at the same time. This lack of diversity means that the full benefits of increased interconnection cannot be realized.

Economic dispatch/fuel cost savings

The full benefits of increased interconnection may also be impeded by the existing long-term take-or-pay commitments which both HEC and CLP have in place.

For example, the Daya Bay nuclear plant has a must-run operational constraint and CLP has a significant electricity purchase obligation until 2014. Similarly, CLP’s Black Point plant also has a must-run status under the take-or-pay gas contract which lasts until 2015. Likewise this applies to HEC’s LNG supply contract for Lamma Extension.

These long-term take-or-pay contracts mean that the most economic dispatch may not be achievable.

6.5 Optimising system resources

At present, the two power companies separately prepare their own demand forecasts and power system development plans.

As identified in the Consultation Paper, increased coordination in planning would entail additional resources for the two power companies or the central agency (should that be established), and more administrative interfaces between the two power companies.¹⁰² As shown in Appendix 2, the costs of setting up and maintaining independent system operators can be substantial. There are also complex legal and commercial issues relating to joint planning. As pointed out by the Government's consultants, this should require some form of regulation applied in the form of a Hong Kong "grid code" which the two power companies will have to observe.¹⁰³

Greater interconnection also means that intra-network augmentation can have significant impact on the other network. This is attributed to the fact that the planned directions and quantities of power flow in the original networks of lesser interconnection will be distorted by the introduction of import or export of electricity between the networks after implementing greater interconnection. In fact, this distorted power flow is one of the biggest problems faced by many interconnected systems because it will recreate bottlenecks on the networks. Therefore, coordination of transmission network planning and augmentation needs to be introduced, including mechanisms for resolving disagreements between the power companies.

As both power companies are separately owned and publicly listed companies, joint planning may not be optimal in terms of optimising individual resources and maximising respective shareholder benefits. HEC is of the view that the costs of implementing such a regime outweigh any benefits that may be achieved.

6.6 Implementation issues

There are a number of complex and interrelated issues which also need to be considered in the context of any proposal to increase interconnection between the two power companies.

Funding

The Consultation Paper considers the possibility of the increased interconnection being funded and operated either jointly by the two power companies or by a third party.

Because of the supply-demand position and the similar load characteristics of both power companies, HEC is of the view that there are currently no economic drivers for building the new interconnector. Given that the costs of the new interconnector will ultimately be borne by all consumers in Hong Kong, HEC is of the view that it is inappropriate for the new interconnector, if required, to be built by either one of the incumbents or a third party.

¹⁰² Consultation Paper p 24.

¹⁰³ Mot Connell Limited, "Investigation Study of Increasing Power Interconnection in Hong Kong" (June 2003) p v.

Funding and operation of new interconnector undertaken by third parties is fraught with difficulties. Australia is one of the few jurisdictions to have allowed merchant-owned interconnectors to be developed. These interconnectors are operated on the basis of obtaining profits by arbitraging the price differentials in the interconnected regions. This has been a failure. The two interconnections, namely between South Australia and Victoria and between Queensland and New South Wales which have been built in Australia have now both applied for regulated status. While the Government is not proposing this model, there are nevertheless lessons to be learnt from the Australian experience. In particular:

- the system operator and incumbent network owners spent considerable time and resources on the technical issues and integration of these interconnectors into the market;
- there were a large number of access issues relating to the operation of the interconnectors and arguments over who should pay for it; and
- the third party who constructed the relevant interconnectors engaged in litigation to prevent the construction of network augmentation which it saw as competing with the operation of the interconnectors.

Reliability

Interconnection, if built for regular power transfers (i.e. the “contract capacity” mentioned above), brings with it increased risks to supply reliability. Experience from overseas electricity markets has illustrated that operational and system disturbances can arise with highly interconnected systems.

In particular, the blackouts in Europe and U.S. in 2003 indicate the cascading effect when a single piece of equipment in an interconnected network breaks down.

As described in the report by the U.S. - Canada Power System Task Force investigating the 14 August 2003 blackout in North Eastern America in which 50 million people lost power after 265 power plants were tripped in a cascading manner:

*“A cascade is a dynamic phenomenon that cannot be stopped by human intervention once started. It occurs when there is a sequential tripping of numerous transmission lines and generators in a widening geographic area. A cascade can be triggered by just a few initiating events, as was seen on August 14.”*¹⁰⁴

One of the contributing factors in that case was the failure of FirstEnergy in Ohio to trim trees causing lines to fault.

¹⁰⁴ U.S. - Canada Power System Task Force, “Final Report on the August 14th Blackout in the United States and Canada” (April 2004). Available at <https://reports.energy.gov/BlackoutFinal-Web.pdf>.

The direct cause of the 2003 blackout in Italy was the fall of power lines in Switzerland due to storm but when a second line tripped seconds later it caused all the lines between Italy and the rest of Europe to trip. Subsequent analysis of the blackout attributed it to a number of structural and regulatory issues including:

“conflict between trading interest of companies involved and technical requirements of the existing system - the existing system is not designed to cope with deregulation”;

*“the unresolved conflict between the trading interests of those involved countries and operators and the technical and legal requirements for the safe and reliable operation of the networks”;*¹⁰⁵

*“many countries in the EU have low reserve generating capacity. This... then leaves less margin in the event of failures”.*¹⁰⁶

Another incident happened on 13 August 2004, when a current transformer at a generator located in the Australian state of New South Wales exploded. This failure led to a major system incident causing a loss of six generators in New South Wales. This sudden loss of generation then caused a fall in power system frequency that automatically triggered load shedding in all of the interconnected regions of Queensland, Victoria and South Australia.¹⁰⁷ This caused much debate in Queensland where a disproportionate number of customers had been disconnected compared to those in the other states, even though there was no fault in the Queensland system and it had surplus generation at that time.

6.7 Do the benefits outweigh the costs and risks?

Given the high costs associated with increased interconnection, the lack of economic drivers and the potential adverse effects on the stability of the system, HEC is of the view that these costs and risks outweigh any potential benefits that may arise from increased interconnection.

¹⁰⁵ Report on the blackout in Italy on 28 September 2003. Available at <http://www.energie-schweiz.ch/imperia/md/content/medienmitteilungen/mm06-122003/89.pdf>.

¹⁰⁶ Hall and Thomas, *“Blackouts: Do liberalisation and privatisation increase the risk?”* PSIRU, University of Greenwich (December 2003) p 9.

¹⁰⁷ NEMMCO, *“Power System Incident Report - Friday 13 August 2004 Final Report”* (28 January 2005). Available at <http://www.nemmco.com.au/marketandsystemevents/232-0022.pdf>.

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7 New supply sources

- HEC agrees with the Government that the Mainland cannot be relied on in the short to medium term as an alternative source of supply for Hong Kong.
- The Mainland will not have surplus electricity to supply Hong Kong in the short to medium term.
- HEC holds the view that even if supply constraints could be resolved in the longer term, the cost of electricity from the Mainland would unlikely be lower than that from local generation if costs for longer transmission distance, reinforcing the transmission networks, and upgrading the environmental and reliability standards at par with those of Hong Kong are included.
- From an environmental perspective, any spare plants, if available, should be used to phase out the existing highly-polluting, low-efficiency small thermal plants in Guangdong rather than used for exporting electricity and, indirectly, pollution to Hong Kong.
- From reliability perspective, importing supply from the Mainland, which has a much lower reliability standard, will jeopardize Hong Kong's supply reliability.
- The fact that operators of electricity facilities in the Mainland are not under the jurisdiction of Hong Kong regulatory authorities will create regulatory risk and uncertainty to operators and investors in Hong Kong. This may lead to under-investment in electricity infrastructure in Hong Kong.
- Based on the above considerations, HEC agrees with the Government that it would not be prudent to predicate the development of the Hong Kong electricity market on supply from the Mainland.
- HEC agrees that introduction of renewable energy sources in Hong Kong should be actively explored. However, practical issues such as cost-effectiveness, technical feasibility, safety and supply reliability issues must be carefully assessed to determine the viability of these new sources of supply.

7.1 Existing arrangements

Currently, the electricity supplied to Hong Kong is primarily sourced from HEC's and CLP's generation assets located in Hong Kong. CLP imports some power from Guangdong Nuclear Power Station at Daya Bay and the Guangzhou Pumped Storage Power Station at Conghua.

7.2 Issues and 'possible' options

The Consultation Paper considers whether there are alternative sources of supply that might enable greater consumer choice in Hong Kong.

The Consultation Paper focuses on two possible sources of alternative supply:

- importing electricity from the Mainland to meet part of the demand in Hong Kong; and
- independent power producers, some of whom might wish to develop renewable energy resources.

7.3 Supply from Mainland China

HEC agrees with the Government that Mainland cannot be relied on in the short to medium term as an alternative source of supply for Hong Kong since the Mainland will not have surplus electricity to supply Hong Kong in the foreseeable future. In addition, HEC holds the view that even if supply constraints could be resolved in the longer term, the cost of electricity from the Mainland would unlikely be lower than that from local generation if costs for longer transmission distance, reinforcing the transmission networks, and upgrading the environmental and reliability standards at par with those of Hong Kong are included.

Furthermore, the fact that operators of electricity facilities in the Mainland are not under the jurisdiction of Hong Kong's regulatory authorities would in itself create regulatory risk and uncertainty for operators in Hong Kong. This could lead to under-investment in electricity infrastructure in Hong Kong.

The above viewpoints of HEC on supply from Mainland China, namely availability, economics, environment, reliability, and regulatory risks and uncertainty, shall be discussed below.

Availability

The supply situation in Guangdong remains very tight. Demand for electricity in Guangdong grew by 35% between 1999 and 2001 and demand continues to grow at about 10% per year. Guangdong has relied heavily on power imports from neighbouring provinces and some power rationing has occurred. At present, Guangdong still has to import from Hong Kong to meet their demand. Their priority is therefore to ensure that it has sufficient installed capacity to meet its own demand rather than to supply Hong Kong.

According to the National Policy, Guangdong should decommission about close to 10,000MW of inefficient and polluting small-capacity generating plants. Due to its high demand growth, Guangdong continues to have difficulties complying with this requirement. If this is to be complied with, Guangdong is unlikely to have any surplus to supply Hong Kong for a very long time.

Economics

There is a prevailing misconception that electricity imported from China, when compared to local generation, would be available at a lower cost. In view of the long transmission distance from Guangdong to Hong Kong and the lack of reserve transmission capacity, it is likely that the transmission networks in Guangdong would need to be upgraded in order to have the capability to export electricity to Hong Kong. Upgrading this system would require a substantial amount of time and money that will eventually be borne by Hong Kong consumers if such upgrade is for facilitating supply to Hong Kong. Accordingly, electricity imported from China may not be competitive when the significantly higher transmission charges are taken into consideration.

Moreover, in an interconnected electricity system, any capacity shortage suffered by one party may have an adverse impact on the supply reliability and electricity price of the other interconnected parties. Given that the power demand in Guangdong is four times higher than that in Hong Kong, a serious shortage of capacity throughout South China would therefore jeopardize the electricity supply reliability and drive up the electricity price in Hong Kong.

One of the prime factors that led to California's electricity crisis is the inadequate generation capacity within the state. This, coupled with an unexpected summer heat wave and a cut down on imported supply, triggered the rolling outages and blackouts during the period of 2000-2001.

A case in point on the importance of self-sufficiency is the experience of Alberta's deregulated electricity market during California's energy crisis in 2000-2001. Alberta became vulnerable to volatile price fluctuations when California, with whom it is interconnected, suffered severe capacity shortages.

Unlike other commodities, electricity price has a much wider range. Wholesale price can jump up from cents per unit to tens of dollars per unit. This can happen in a very short time and without any sign as long as there is a genuine or expected power shortage. Many markets have set very high level of Value of Lost Load (VOLL), e.g. A\$10,000 per MWh in Australia. This price will be paid to all generation in the system during power shortage.

The above examples illustrate two possible phenomena that may happen in Hong Kong if there is firm supply from South China:

- When South China experiences power shortage, Hong Kong will suffer too. There would be little manoeuvre room for HEC to meet its customer demand if it has to depend on other parties for firm capacity.
- When there is a price hike in South China, it will affect Hong Kong as well. HEC will be forced to pay high import prices in case of system disturbances, heat wave and/or power shortages.

Environment

In fact, even if the supply and demand situation in Guangdong can be balanced in medium to long-term via the import of hydro power from the neighbouring provinces/areas, the highly-polluting, low-efficiency small thermal plants operating in Guangdong will still pose an environmental threat to the whole Pearl River Delta region. In order to improve the overall environmental performance in the region, any spare plants, if available, should be used to phase out these polluting thermal plants rather than used for exporting electricity and, indirectly, pollution to Hong Kong. Thus, even if the supply constraints can be resolved in the medium to long term, from an environmental perspective, Hong Kong should still rely on its own highly environmentally friendly plants instead of the inefficient and polluting thermal plants in Guangdong for electricity.

Reliability

At present, reliability of supply, which requires both the generation plants and the networks to perform well, is under the full control of the two Hong Kong utilities. With adequate infrastructure and good asset management in place, Hong Kong's supply reliability is among the highest in the world.

In terms of generation reliability, the California's energy crisis in 2000-2001 illustrates vividly that if Hong Kong is to be supplied by South China, any capacity shortage suffered by South China will result in a cut down on imported electricity and a deterioration of supply reliability in Hong Kong.

In terms of network reliability, the networks of South China are not at par with Hong Kong's networks. To depend on China for electricity supply, electricity has to flow across the South China networks before getting into the Hong Kong networks. As such, no matter how reliable the Hong Kong networks are, a less reliable transport system on the other side of the border will jeopardize the high supply reliability presently enjoyed by consumers in Hong Kong.

Regulatory risks and uncertainty

Under the present one-country-two-systems regime, the regulatory authorities in Hong Kong will not have any jurisdiction over generators and network operators in South China. It would then be difficult for the Government to exercise stringent legislative and administrative control of all electricity supply facilities supplying Hong Kong on safety, reliability, and environmental protection. This will pose regulatory risks.

Moreover, since operators of electricity facilities in Hong Kong and South China are not regulated under the same system and jurisdiction, one cannot rule out the possibility that there might be changes in regulation in the Chinese system that are unfavourable to the Hong Kong operators. These factors, together with the fact that the operation of the electricity facilities in China is far from being transparent, will create uncertainty to investors and will lead to under-investment in electricity infrastructure in Hong Kong.

7.4 Supply from other local sources

HEC agrees that the introduction of renewable energy sources to Hong Kong should be actively explored. To that end, HEC agreed at the last SCA Interim Review in 2003 to set up a production scale wind turbine to assist in exploring possible further use of wind power generation for Hong Kong.

However, there are a number of practical issues, including cost effectiveness, technical feasibility, and supply reliability and safety, that need to be considered and addressed before renewable energy can be factored properly into the development of Hong Kong's future electricity market.

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8 Grid access for third-party users

- System reliability and safety are paramount and any benefits arising from increased grid access need to be carefully weighed against possible adverse impact on system reliability and safety.
- HEC is of the view that the voluntary approach is more appropriate and that any requests for access must be considered on a case-by-case basis.
- The costs of establishing and administering an open access regime are potentially very large and will ultimately be borne by consumers.
- Open access regimes are based on the assumption that competition is a workable proposition in the relevant market. The unique characteristics of the Hong Kong market mean that meaningful competition will be difficult to establish in the short to medium term.
- Hong Kong's power suppliers have made huge investments in long-term infrastructure. One of the significant costs of reform in other jurisdictions has been stranded costs related to sunk investments.

8.1 Existing arrangements

The existing electricity transmission and distribution networks in Hong Kong are separately owned and operated by HEC and CLP.

Under the current SCA, neither HEC nor CLP is granted a franchise over the networks in the areas they cover. However, due to the high costs in duplicating networks and other practical limitations such as land availability, it is generally uneconomic and impractical to duplicate the power grid.

For HEC, connection of independent generation resources to the power grid is presently arranged through bilateral negotiation on a case-by-case basis.

In September 2004, EMSD set up a working committee, which included representatives from HEC, CLP and a wide spectrum of stakeholders, on the preparation of a technical guideline for the grid connection of small-scale renewable energy power systems. EMSD launched the guideline at end March 2005 as soon as the guideline was fully developed and agreed on by all members of the working committee.

8.2 Issues and 'possible' options

The main issue identified with the existing arrangement is that it acts as a barrier to new market entrants that inhibits increased competition in the electricity supply sector. It is also suggested that the introduction of open access may facilitate the development of alternative sources of supply such as renewable energy and energy-from-waste technologies.

The Consultation Paper canvasses two possible approaches to facilitating access to the power grid:

- the voluntary approach under which the power companies would be encouraged by the Government to make individual arrangements for third party access with details on technical, reliability and safety requirements, and responsibilities and liabilities to be covered by bilateral agreements between the power companies and the grid users; and
- the mandatory approach which compels the grid owners to provide access to third parties provided certain stipulated connection requirements are met.

Under the mandatory approach, a new regulatory framework would be introduced through legislation which would:

- stipulate issues relating to technical standards and liability to be specified in the agreement between the grid owner and the users; and
- provide detailed specifications covering codes of conduct, technical standards for connection, access charges and dispute resolution mechanisms.

8.3 Voluntary approach

HEC is of the view that the voluntary approach is more appropriate and that any requests for access must be considered on a case-by-case basis with careful consideration of the following issues:

- safety of the general public, and safety of employees working for the power companies and the third party users;
- potential effects on system reliability; and
- cross subsidies - the allocation of any additional costs incurred for the grid to ensure safety and reliability in the implementation of third-party access should be on a user-pays basis, i.e. the third party users should bear the full costs without receiving any cross subsidies from other consumers.

8.4 Mandated open access

The main driver for an open access regime is to introduce greater competition in the supply of electricity. However, the introduction of any form of mandated open access needs to be critically examined in light of:

- the set up and ongoing costs associated with establishing such an open access regime, for both the utility and the Government;
- the complexities associated with regulating open access pricing (in particular, disputes);
- the possible detrimental effects on system and supply reliability - any new connections must not affect the reliability of supply to HEC's existing customers;
- the possible dampening effect on investment if utilities are concerned that their investment will be undermined by "free riders"; and
- whether competition is likely or appropriate in the context of the Hong Kong environment.

8.5 System reliability

Any proposal in relation to open grid access needs to be considered very carefully in the context of its potential impact on system reliability.

At present, Hong Kong enjoys an outstanding level of system reliability. Mandated open access to the grid in Hong Kong has the potential to shift the paradigm of system reliability. Reliability has traditionally been regarded as being of primary importance in the context of electricity networks. However, HEC is concerned that this reliability may be compromised if an open access regime is imposed.

Under the existing arrangement, decisions on grid construction and usage are based on “keeping the lights on” for its customers. Although reliability obviously remains a key concern for network owners in open access environment, new market dynamics caused by open access change the engineering aspects of grid reliability.

International experience has shown that system reliability can degenerate under open access regime. It has been observed in the U.S. that:

*“Whereas electricity grid reliability was expected, in fact taken for granted, during the era of franchise monopolies, reduced reliability and the potential for unexpected blackouts have surfaced as an undesirable by-product of electricity restructuring.”*¹⁰⁸

The U.S. - Canada Power System Outage Task Force that investigated the causes of the 2003 blackout in U.S. and Canada observed that:

*“It is likely that the increased loads and flows across a transmission grid that has experienced little new investment is causing greater ‘stress upon the hardware, software and human beings that are the critical components of the system’.”*¹⁰⁹

8.6 Costs of mandated open access

The introduction of mandated open access would represent a fundamental shift away from the existing light-handed form of regulation.

It would require the introduction of a completely new legislative regime framework to deal with issues such as:

- reliability standards, codes and rules;
- technical standards for connection;
- access pricing;
- liability as between market participants;
- dispute resolution process to deal with disputes in relation to access pricing and between market participants; and
- the establishment of an independent system operator.

¹⁰⁸ Whitfield, M, “Update on the Impact of Electricity Market Competition in the USA on the Nuclear Industry” The Uranium Institute 25th Annual Symposium (30 August - 1 September 2000) London, p 4

¹⁰⁹ U.S. - Canada Power System Outage Task Force, “The Final Report on August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations” (April 2004) p 32.

The costs of establishing and administering this regime are likely to be extremely high. Given that these costs will ultimately be borne by the consumers, careful consideration needs to be given as to whether the benefits outweigh the costs of an open access regime.

Set up costs

The introduction of such a major regulatory change requires substantial set-up costs that result from the creation of new organisations, the investment in new hardware and software and the changes to operating systems.

For example, the set up costs in California were estimated at US\$500 million.¹¹⁰ Other jurisdictions have also incurred substantial set up costs associated with open access regimes. Details of these costs are set out in Appendix 2.

Costs of economic regulation

Open access ultimately entails some form of economic regulation on transmission tariffs for third party users. The Consultation Paper does not indicate who would perform this role, however it would clearly require the establishment of a new body, whether that be a government or an independent body, to regulate those tariffs.

The costs of economic regulation are substantial. For example, annual budgets for state regulatory commissions in the U.S. and Australia are measured in the tens of millions of dollars. Further details of these costs are contained in Appendix 2.

In addition, there are substantial costs incurred by market participants who operate under an open access regime. To comply with the regime, market participants must prepare access agreements, respond to information requirements of the regulator and prepare submissions to inquiries. This often involves employing external consultants as well as dedicating significant internal resources to the process.

Costs of independent system operator (ISO)

ISOs are a common element of market restructuring and assume responsibility for grid operation via dispatch, congestion management and other functions.

In North America, annual operational costs of ISOs have typically been in the hundreds of millions of U.S. dollars,¹¹¹ while the formerly integrated utilities have experienced little cost savings in this area as they continue to perform many transmission-related functions (e.g. load forecasts and schedule preparation).

¹¹⁰ The Electricity Industry: “*Reliability and the Road Ahead for Hong Kong*”, transcript from conference, Session 1 (29 April 2004).

¹¹¹ Lutzenhiser, M. (2004) “*An expensive experiment? RTO dollars and sense.*” Public Utilities Fortnightly 142(12) pp 38- 44.

According to a recent study in the U.S., the operational costs of newly formed transmission operators were found to have “*doubled since 2001 and now outweigh nearly all of the benefits of anticipated by the national cost-benefit studies.*”¹¹²

The study also found that the impact on consumers of creating the new transmission operators worsens over time.

*“In near term ... RTO [Regional Transmission Operator] creation may have a neutral impact on consumers.... In the mid term, the net benefit ranges from zero to -\$300 million per year...In the long term, the net impact on consumers is -\$200 million to -\$300 million per year”*¹¹³

Further details on the costs of ISOs in other countries are contained in Appendix 2.

8.7 Access pricing and disputes

The move to open grid access also brings with it issues relating to access pricing.

Network access pricing is a complex issue and disputes inevitably arise in relation to the outcome of access pricing reviews. Evidence from overseas indicates that this can lead to protracted disputes and insufficient investment in infrastructure.

*“Australian experience with regulated and merchant transmission lines has certainly been characterised by controversies, litigation, and delayed investment in regulated transmission.”*¹¹⁴

The cost implication of these disputes, together with the potential impact on future investment, is an important consideration in relation to any moves towards an open access regime.

8.8 Competition

Is competition workable in Hong Kong?

The option to mandate open access is predicated on the assumption that competition in electricity supply market in Hong Kong is a workable proposition.

There are a number of unique local factors which make it difficult to introduce meaningful competition to the Hong Kong electricity market.

¹¹² Lutzenhiser, M, (2004) “An Expensive Experiment? RTO dollars and sense”, Public Utilities Fortnightly 142(12) p 39.

¹¹³ Liutzenhiser, M, (2004) “An Expensive Experiment? RTO dollars and sense”, Public Utilities Fortnightly 142(12) p 41.

¹¹⁴ Littlechild, S, (2004) “Regulated and merchant interconnectors in Australia: SNI and Murraylink revisited”, CMI Working Paper 37, Department of Applied Economics, University of Cambridge, UK p 1.

Hong Kong is a relatively small market which ultimately would be capable of supporting only a small number of new participants. Competition, which would require a complex regulatory framework, may not be justified given the relatively small scale of the Hong Kong electricity market.

The fact that Hong Kong has no indigenous energy sources and only limited land resources would make it very difficult for new participants to enter the market. In the long term, meaningful competition is dependent on whether there are viable alternative sources of supply from South China. As discussed in section 7, HEC is of the view that competition involving South China is, at best, a long-term option.

Finally, Hong Kong does not have the infrastructure required to support competition in the market, such as customer transfer processes and metering facilities.

Stranded costs

Another risk associated with the introduction of competition is that existing assets will become stranded. Stranded costs are costs that have been prudently incurred, as approved by the Government, by utilities to serve their customers, but which cannot be recovered when the market or regulatory structure changes.

Stranded costs usually arise in the context of investor-owned utilities where a company's value is determined through the market's expectations. To maintain the confidence of the market and to ensure that the Government's agreements with the utilities are honoured, the utilities should be entitled to recover the costs associated with investments previously approved by the Government.

Stranded costs have been a particular issue in the U.S. where large stranded costs were incurred by utilities as part of the transition to a competitive market. These stranded costs were recognized by the Federal Energy Regulatory Commission (FERC) by Order 888 where FERC reaffirmed that the recovery of legitimate, prudent and verifiable stranded costs should be allowed.

8.9 Development of renewable energy sources

HEC acknowledges that the development of renewable energy sources is an important element of the Government's energy policy.

To that end, HEC has, in conjunction with EMSD, been actively involved in the development of technical guidelines for the grid connection of small-scale renewable energy power systems.

However, wind generation projects, particularly on a large scale, bring with them a host of technical and reliability issues:

- as wind is intermittent and cannot be relied upon, it is difficult to forecast its availability and doubtful whether wind generation should be counted as firm capacity in determining whether reserve margins are met;
- it creates difficulties in managing flows of electricity over the network; and

- as they are unscheduled plants, they can unbalance the system leading to greater requirements for ancillary services.¹¹⁵

Accordingly, HEC is of the view that grid access for these facilities needs to be carefully considered on a case-by-case basis to ensure that high system reliability is maintained.

8.10 Do the benefits outweigh the costs and risks?

Any moves toward open access to the grid should be based on a careful cost-benefit analysis.

Mandated open access is a radical departure from the existing form of regulation in Hong Kong. The international experience provides a salutary lesson as to the difficulty and often financially disastrous effect of market reform.

HEC is of the view that at this stage, the costs and uncertainties involved in introducing such a regime, and the potential adverse impact on system reliability outweigh any potential competition benefits that may arise as a result of open access.

¹¹⁵ For example, these issues are discussed in the Australian context in a NEMMCO paper “Forecasting Intermittent Generation in the National Electricity Market” available at <http://www.nemmco.com.au/dispatchandpricing/260-0005.pdf> and a paper by the Australian Ministerial Council on Energy “*Integrating Wind Farms into the National Electricity Market*” available at <http://www.mce.gov.au>.

9 Bilateral agreement versus legislation

Regulation by bilateral agreement has a proven track record in Hong Kong. In particular, regulation by bilateral agreement has:

- provided certainty to market participants and facilitated investment;
- resulted in a high level of supply reliability for industrial, commercial and residential users and consumers; and
- created a simple and cost effective means of regulation.

The goal of increased regulatory flexibility needs to be considered in the context of the possible risks associated with introducing a new regulatory regime implemented through legislation. These risks include:

- loss of certainty for investors and the consequent risk of under-investment;
- increased regulatory costs associated with the establishment and ongoing administration of the regulatory regime which will ultimately be borne by consumers;
- greater complexity and bureaucracy; and
- the consequences of getting the legislative regime wrong.

9.1 The existing regulatory arrangements

Economic regulation of HEC is currently exercised through the SCA. The SCA was first introduced in 1963 and has been operating in Hong Kong for over 40 years.

The SCA, which has a term of 15 years, sets out HEC's obligations and rights, and provides a framework for the Government to monitor HEC's financial affairs and technical performance. The SCA includes provisions for:

- the parties to agree to the submission of five yearly Financial Plans which include the capital and operating plans and the submission of new Financial Plans at any time if warranted by circumstances;
- annual tariff reviews and annual auditing reviews of the technical and financial performances of the power companies; and
- five yearly interim reviews of the SCA.

As discussed in the sections above, new investment and material changes in tariffs must be approved by the Government's regulating bureau and, if deemed necessary, the Executive Council of the Government.

The SCA has proven to be a simple, low-cost regime which has delivered on the Government's objectives without the need for Government funding or subsidies.

9.2 Criticisms of the existing regulatory arrangements

The main criticism of the existing regulation through bilateral agreement is that it requires the consent of the parties to the agreement before amendments can be made and therefore restricts flexibility to introduce changes to take account of prevailing circumstances.

Although the agreement cannot be amended without the consent of the parties, the annual financial and technical reviews and their respective audits do give the Government a degree of flexibility in administering the regulatory arrangements.

The five yearly interim reviews have also provided the signing parties with an opportunity to amend the SCA to deal with particular issues. For example, as part of the 1998 and 2003 SCA Interim Reviews, HEC and the Government agreed on new provisions to deal with excess capacity via an excess capacity adjustment and a new mechanism to prevent large balances from accumulating in the Development Fund.

HEC also agreed, as part of the 2003 SCA Interim Review, to set up a production scale wind turbine to assist in exploring possible further use of wind power generation for Hong Kong.

9.3 What are the ‘possible’ options?

In addition to the current regulatory arrangements, the other options considered in the Consultation Paper are ¹¹⁶:

- shortening the agreement period to a 5- or 10-year duration; or
- replacing the SCA with a regulatory framework supported by legislation which could include an appeal procedure for regulatory decisions and/or a dispute resolution mechanism.

9.4 Shorter regulatory periods

In relation to the first option, the Government recognizes that the uncertainties arising from a shorter agreement period would deter continued or long-term investment by the power companies.¹¹⁷

HEC agrees with this view. As indicated above, the current SCA, which has a 15-year regulatory period, has created an environment where investors can confidently invest in new infrastructure. Given the long-term nature of investment in electricity infrastructure and the long-term contractual requirements (e.g. the long-term LNG take-or-pay agreements), the current 15-year regulatory period is appropriate.

Even with a 15-year regulatory period, HEC faces significant re-contracting risk as its investment in electricity infrastructure will not be fully recovered over that period.

It is important to remember that investments in electricity infrastructure are generally sunk costs. To make such an investment requires HEC to have a high degree of confidence in the regulatory regime that:

- HEC will recover its costs and earn a reasonable return; and
- HEC’s assets will not become stranded by future disallowance from the rate base.

A shorter regulatory period significantly increases the investment risk - governments or regulators will have more opportunities to “second-guess” an investment during its life cycle after it is sunk; even though it was prudently made at the time of the investment decision, and on the basis of achieving a certain rate of return which could have been earned on a similar investment at that time.

Biglaiser and Ma (1999) noted the adverse impact of re-contracting on investment:

“The incentive to invest ex ante may be reduced or become absent altogether because the returns of a sunk investment cannot be guaranteed due to the lack of [regulator] commitment.” ¹¹⁸

¹¹⁶ Consultation Paper pp 33-34.

¹¹⁷ Consultation Paper p 33.

The additional risk would impact on the level of investment in existing and new infrastructure unless that additional risk was mitigated by a higher rate of return.

9.5 A new regulatory framework

There is no doubt that a legislative model under which the Government can change the regulatory framework without the agreement of participants gives the Government greater flexibility. However:

- this is at the expense of investment certainty and creates greater regulatory risk;
- since this framework would be a paradigm shift in regulation in Hong Kong, there is a risk of getting it wrong; and
- there is a significant expense involved in establishing that framework.

Regulatory risk

Regulation by legislation would represent a fundamental shift in the form of regulation in Hong Kong. Essentially, market participants would move from an environment where there is certainty as to investment arising from a mutually negotiated framework to a regulatory regime under which the Government can change the regulatory framework without the agreement of participants.

Private sector firms, equity investors and financiers will need to take a view on regulatory risk under a legislative regime and the potential for adverse change after an investment has been made.

An article in the McKinsey Quarterly considered that the considerable discretion given to regulators in the U.K. to determine prices at the commencement of each regulatory period produced market uncertainty. It suggested that this market uncertainty explained some of the increased cost of equity for utilities under the U.K. system as compared to the U.S. utilities:

*“Thus the real allowed return in the United Kingdom must typically be more than 1 percent higher than the return in the United States. The cost to the United Kingdom’s economy is between \$2 billion and \$3 billion a year in higher utility charges – equivalent to about an extra 1 percent on the basic rate of personal income tax.”*¹¹⁹

¹¹⁸ Productivity Commission, “Review of the Gas Access Regime” Report no. 31 (2004) Canberra, p 105.

¹¹⁹ Dobbs R and Elson M, “Regulating Utilities: Have we got the formula right?” (1999), The McKinsey Quarterly; 1999 Number 1. Available at www.mckinseyquarterly.com.

Regulatory bodies themselves have recognized that:

*“...excessive discretion or the inappropriate exercise of discretion can increase uncertainty and regulatory risk which in turn increase the costs of capital, or prevent companies from undertaking investments or initiatives that would otherwise improve efficiency”*¹²⁰

In contrast, the SCA has proven to be an effective means of providing certainty for market participants and created an environment where investors have confidently invested in assets to meet growing demand.

Costs of getting the legislative framework wrong

The costs of getting the regulatory framework wrong are enormous. The proposal is not an incremental change but a replacement of the existing regime. Electricity is unique; international experience has shown that reform involving electricity industries is complex and has many pitfalls.

In particular, inappropriate regulation can lead to systematic under-investment that in turn can lead to infrastructure failure. At worst, it can lead to market failure such as that occurred in California.

A case in point is the U.S. where there is ongoing debate on issues like regional transmission organisations; standard market design; and incentives for, and cost recovery of transmission and distribution investment. The ensuing outcome is alarming, as summarized by the National Council of Energy Policy in the U.S.:

*“Electricity-industry restructuring has derailed. The massive blackout of August 14 2003 was not needed to underscore the point, but it adds urgency to the effort to find solutions. Indeed, investment in all categories of electricity is down significantly.”*¹²¹

The consequences of under-investment in electricity infrastructure have been highlighted recently in a number of countries where major blackouts have occurred. For example, the blackout in Italy in 2003 affected 57 million people. This blackout has been attributed to the fact that companies are unwilling to spend money on assets where the return is low or uncertain, especially if the market is unwilling to compensate for reliability.¹²² Appendix 1 provides further examples of how supply reliability can be affected due to a lack of investment in existing and new infrastructure.

In contrast, under the SCA, Hong Kong has enjoyed high levels of supply reliability.

¹²⁰ Essential Services Commission Victoria “Productivity Commission Review of the Gas Access Regime - Submission to the Draft Report by the Essential Services Commission” 7 April 2004, p 8.

¹²¹ National Commission on Energy Policy (2003) “Reviving the electricity sector”, Washington DC, p 3.

¹²² Hall and Thomas, “Blackouts: Do liberalisation and privatisation increase the risk?” PSIRU, University of Greenwich (December 2003) p 8.

Costs of establishing new regulatory framework

International experience has shown that the costs of establishing a new regulatory regime can be extremely high. There is not only the cost of establishing the regime and new institutions but the possibility of compensating investors for stranded assets resulting from such change.

In addition, the ongoing costs of administering the legislative regime are also potentially very large. Examples of regulatory set up costs and ongoing administration costs are contained in Appendix 2. These additional costs will ultimately be borne by consumers.

In contrast, the SCA has proven to be a cost effective means of regulating the industry.

Distortions in behaviour

Switching to a heavy-handed regulation by legislation requires the power companies to commit significant resources to carry out the activities required by the new regulatory regime. There will be increased incentives for interested parties to engage in lobbying, bargaining and negotiation. For power companies, this kind of activities will ultimately result in an increase in costs to be borne by the consumers.

A sharp observation was made by Professor Yarrow: *"In the practice of regulation, supply creates its own demand: provide an authority discretionary powers and there will be no shortage of lobbyists urging the use of those powers for purposes that suit their own interests."*¹²³

Do the benefits outweigh the risks?

The introduction of a regulatory regime backed by legislation would undoubtedly give the Government greater flexibility to change the regulatory rules if it considers such change to be necessary. However, increased flexibility for the Government has the trade-off of more regulatory uncertainties for market participants.

Hong Kong has a simple, low-cost regime which has delivered a reliable supply of electricity at a reasonable cost. Establishing a new regulatory regime will be costly and time consuming, and there is ultimately no guarantee that the new regime would more effectively meet the Government's policy objectives.

HEC is of the view that the uncertainties and costs associated with implementing a new legislative framework and the potential adverse impact on investment outweigh the increased flexibility introduced into the regulation of the electricity industry.

¹²³ Yarrow, G., Regulatory Policy Institute, Oxford, *"Regulating for Competition"* (2000) paper prepared for the UK Communications White Paper, p.16.

10 Government regulation versus independent regulation

- Government regulation has proven to be an efficient and effective means of regulating the electricity industry in Hong Kong.
- Electricity is an essential service. The Government should not abrogate responsibility for regulating service provision lightly. The Government remains best placed to implement its primary policy objectives.
- Arguments for an independent regulatory body lose cogency in the Hong Kong market where the incumbents are already privately owned and the Government does not participate in the industry.
- Independent regulation brings with it the risk of regulatory capture.
- The costs of setting up an independent regulator and the ongoing costs of maintaining an independent regulatory regime outweigh any perceived benefits of having independent regulation.

10.1 Existing Government Regulation

At present, the Government is responsible for the economic regulation of the electricity industry through the SCA. Regulatory oversight is undertaken by various authorities within the Government as outlined in section 2.3 of the Consultation Paper.

10.2 Criticisms of Government regulation

The perceived problems with the existing institutional arrangements are:

- at present the regulatory oversight is undertaken by various authorities within the government and the coordination and interfacing between the different bureaux and departments adds to the administrative procedures; and
- there is no independent “one-stop shop” to deal with all related regulatory issues.

10.3 What are the possible options?

The possible options canvassed in the Consultation Paper are ¹²⁴:

- (a) funnel relevant personnel and/or expertise from the various bureaux/departments to form an agency within the Government to take over the electricity-related environmental policies and to execute all existing and new regulatory functions;
- (b) establish an independent authority which would be:
 - i. established and empowered by legislation, with a governing board which represents interests of investors and consumers, to ensure independent and impartial decision making;
 - ii. responsible for executing all regulatory functions relating to the electricity market, and making recommendations to the Government on relevant policy issues; and
 - iii. funded by the Government, and/or through appropriate fees levied on market participants.

10.4 Centralising functions within the Government

HEC is of the view that the current approach of sharing regulatory responsibility among EDLB, ETWB and EMSD, and with the advice of the Energy Advisory Committee (EnAC), is an appropriate division of responsibility within the Government.

¹²⁴ Consultation Paper pp 35-36.

This approach is consistent with that taken in many overseas jurisdictions where there are separate authorities dealing with economic regulation, environmental regulation and technical and safety regulation. Normally, the independent regulator in these jurisdictions is only responsible for economic regulation.

The existing arrangements are flexible enough to enable resources to be deployed within the Government as and when required. Any moves to centralize the regulatory functions into one agency will need to be carefully considered as this may ultimately lead to greater bureaucracy and higher administration costs.

10.5 Is independent regulation necessary in Hong Kong?

The argument for an independent regulator to oversee the electricity sector has principally arisen in markets where reform has centred on the privatisation of state-owned enterprises and where full competition has been introduced. In this context, there has been a perceived need to remove any direct political interference and possible lack of neutrality from the regulatory process, particularly where the government remains a market participant after the reforms have been introduced.

However, the arguments for an independent regulatory body lose cogency in the Hong Kong market where the incumbents are already privately owned and the Government does not participate in the industry. In these circumstances, the arguments for an independent regulator are less compelling.

The costs of independent regulation

Any new regulatory institution would need to be established by legislation and require funding. The costs of establishing and maintaining an independent regulatory body can be extremely high. Ultimately, these costs will be borne by consumers.

There is also a significant risk that these costs increase over time. The International Energy Agency has noted that:

*“The move towards political independence has implications for the management of the public sector because it usually entails setting up a separate organisation. This is costly, and more importantly, establishing autonomous organisations may produce some problems in the long term because of the tendency of organisations to grow and self-perpetuate.”*¹²⁵

Examples of regulatory set up costs and ongoing administrative costs in other countries that have been through the reform process are contained in Appendix 2. These costs are significant.

¹²⁵ International Energy Agency, “Regulatory Institutions in Liberalised Electricity Markets” (2001), p 18.

Over-regulation

Professor Kahn, one of America's most famous economists, noted that new layers of regulation are sometimes introduced in response to adjustments made by the regulated business. This has also been observed by Spann who has noted that:

*"In their attempts to eliminate, or at least reduce, some of the distortions created by the original simple decision rule...regulators often find that they must continually extend their regulatory controls as firms make adjustments to previously imposed constraints."*¹²⁶

In contrast, the SCA has proven to be a relatively simple and light-handed form of regulation.

Risk of regulatory capture

Independent regulation brings with it the risk of regulatory capture. Regulatory capture refers to the risk that administration of the regulatory regime might be influenced by other interests. Regulatory capture can manifest itself in a number of ways. For example:

- regulators might have their own personal objectives. The incentives of employees of regulatory agencies depend on the type of employee, and understanding of their motivations is important in explaining the policies that are implemented;¹²⁷
- regulators might be captured by the businesses they regulate. The regulators deal frequently with the businesses they regulate and might identify too closely with these businesses;¹²⁸ and
- there is often a tendency for regulators to favour consumers to prove their value and enhance their popularity. It has been observed that:

¹²⁶ Spann, R.M. (1975) "Taxation and electric utility regulation and the efficient allocation of energy resources" in Cicchetti, C.J. and Jurewitz, J.L. (eds), *Studies in Electric Utility Regulation* Ballinger Publishing Company, Cambridge, Massachusetts, p 172.

¹²⁷ Productivity Commission "Review of the Gas Access Regime" Report no 31 (2004) Canberra, p 157.

¹²⁸ Stigler, G.J. (1971) "The theory of economic regulation", *Bell Journal of Economics*, vol 2, no 1, pp 3-21.

“There is often a tendency for regulators, in an attempt to protect the public interest, to treat extraordinary losses and gains differently. For example, if a firm makes a decision that later proves to have been wrong (e.g. to build a power plant that ends up being unneeded, or ends up costing much more than expected), there is a tendency to force the firm (namely the shareholders) to bear the part of the costs of the ‘mistake’ rather than pass the entire cost onto the firm’s customers. On the other hand, if the utility makes a decision that results in much greater profits than expected (e.g. negotiates long-term contracts for the supply of inputs just before the spot price of these inputs unexpectedly skyrockets), then there is a tendency for the gains to be passed on to customers, because allowing the firm to retain the extra profits would result in the firm earning more than a ‘fair’ return.”¹²⁹

10.6 Do the benefits outweigh the costs and risks?

Electricity is an essential service. It is a critical input into the creation of all goods and services. Given that it is such an essential service, the Government should not abrogate responsibility for regulating the industry unless there are compelling reasons to do so.

In the Consultation Paper, it is acknowledged that *“the existing organisational structure has worked well and ensured that financial and supply reliability, safety and efficiency considerations are appropriately balanced against environmental considerations”*.¹³⁰

HEC acknowledges that in certain markets, there may be some need for independent regulation instead of government regulation. This is particularly so where there are numerous firms participating or where the Government retains some interest in the market.

Hong Kong has a relatively small electricity market with only two market participants and the Government does not have any direct interest in the market. In light of these two market characteristics, the potential costs, and the regulatory uncertainty associated with introducing independent regulation to Hong Kong, HEC is of the view that there are no compelling reasons to depart from the existing form of Government regulation.

¹²⁹ Train, K.E. (1991) *Optimal Regulation: The Economic Theory of Natural Monopoly*, MIT Press, Cambridge, Massachusetts, pp 96-97.

¹³⁰ Consultation Paper, p 35.

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11 Conclusions and recommendations

The expiry of the current SCA gives the Government and the community an important opportunity to secure a reliable and economically efficient power supply for Hong Kong's future.

In an environment of continuing economic uncertainty, rising fuel prices and increasing environmental pressures, HEC recognizes that the Government and the community face a delicate task in balancing a range of often competing objectives.

However, paramount among these is the undisputed fact that the outstanding reliability achieved by Hong Kong's power companies over the SCA periods has been a vital contributor to Hong Kong's economic progress and prosperity. As many countries with experience of market reform have discovered to their detriment and chagrin, reliable power supply is very easy to take for granted but very difficult to fix once compromised.

On this basis, HEC is of the view that it is important that changes are not imposed merely for the sake of change. That said, should the Government and the community decide to introduce changes, such changes must:

- firstly, be a visible improvement on the current regime and not create instability and uncertainty, taking into account the Government's key policy objectives; and
- secondly, provide benefits which unambiguously outweigh the costs and risks of implementing them.

On the first point, HEC believes that the SCA has accomplished very high achievements. It has provided a framework that has delivered on the Government's key policy objectives for a number of decades at minimal cost and without Government subsidies. It has provided high reliability at reasonable cost and a proven framework for the implementation of environmental policy. In other words, the SCA has worked extremely well.

On the second point, HEC has spent considerable time and energy in reviewing the possible changes. HEC does not believe that any of the suggested changes has benefits that demonstrably outweigh both the costs of implementing them and the risks they introduce. Fundamentally, the suggested changes involve the introduction of complexity into what has been, to date, a simple regulatory system that works. With complexity comes both additional costs and the risk of unintended consequences. Experimentation must be avoided.

Experience shows that there is no perfect regulatory model. Each model has its flaws and limitations. Even relatively minor changes can alter the dynamics of the industry and the incentives to invest. In seeking improvement, the community needs to be ensured that the changes, if any, do not upset the balance of the existing regime, which has contributed so positively to Hong Kong. On this basis, major changes must be dismissed as unnecessary, misguided and risky.

HEC is of the view that there is no clear case for significant changes but a very real risk of jeopardising Hong Kong's existing supply of safe, reliable and reasonably priced electricity.

Accordingly, HEC recommends that the Government's Stage II Consultation should proceed on the basis that the SCA would be retained in its current form. Replacing it with the new regime based on increased interconnection, open access and competition, or a regulatory model governed by legislation and an independent regulator would not represent clear improvements. Indeed, they would raise real issues and risks that contain far-reaching ramifications.

HEC believes the Stage II Consultation should concentrate on:

- agreeing on the elements of the current SCA for the next term given that the existing balance of the SCA is appropriate; and
- refining the SCA by making appropriate adjustments within the current framework that clearly enhance the regime and further deliver on the Government's objectives.

HEC looks forward to working with the Government and other stakeholders in Stage II Consultation.

12 Abbreviations

CAPM	Capital Asset Pricing Model
CLP	CLP Power Hong Kong, Ltd.
Consultation Paper	Stage One Consultation Paper on Future Development of the Electricity Market in Hong Kong
COE	Cost of Equity
CPI	Consumer Price Index
DGM	Dividend Growth Model
EDLB	Economic Development and Labour Bureau
EMSD	Electrical and Mechanical Services Department
ETWB	Environment, Transport and Works Bureau
FCA	Fuel Clause Account
FGD	Flue Gas Desulphurization
FERC	Federal Energy Regulatory Commission (U.S.)
HEC	The Hongkong Electric Co., Ltd.
HEH	Hongkong Electric Holdings, Ltd.
ISO	Independent System Operator
LOLP	Loss of Load Probability
NEMMCO	National Electricity Market Management Company (Australia)
OECD	Organisation for Economic Co-operation and Development
Ofgem	The Office of Gas and Electricity Markets (U.K.)
PBR	Performance Based Regulation
ROA	Return on Asset
ROE	Return on Equity
ROR	Rate of Return
RPI	Retail Price Index
SCA	Scheme of Control Agreement

VOLL Value of Lost Load

WACC Weighted average cost of capital

Appendix 1 - Recent failures in deregulated markets

Blackout Incident:	South Australia, 14 March 2005
No. of people affected:	Supply to about 60 per cent of 760,000 customers were interrupted for 50 minutes to 2 hours. ¹³¹
Estimated economic losses:	Figures not available.
Causes:	Fault in a high-voltage network caused a failure in the electricity interconnector between South Australia and Victoria. ¹³²
Commentary:	“Was the 3rd time since 1999 that the Port Augusta to Adelaide high voltage line had experienced faults.”¹³³ “Brought calls for increased infrastructure spending to provide absolute reliability.”¹³⁴

¹³¹ “60 per cent of customers left in the dark” The Advertiser (15 March 2005)

¹³² NEMMCO Power System Incident Report (14 March 2005); “Power companies face lawsuits over outage” *The Courier Mail* (14 March 05).

¹³³ “Dusty insulator cuts state’s power,” *The Courier Mail* (15 March 05).

¹³⁴ Moran, A, “Meeting Gas and Power Infrastructure Needs”, Address to the Australian Energy Summit (17 March 2005).

Blackout Incident:	Queensland, Australia, 24 January 2004
No. of people affected:	Up to 120,000 people were affected over 5 days.
Estimated economic losses:	Figures not available.
Causes:	A series of severe thunderstorms that damaged power lines, transformers and cross-arms in Southeast Queensland. ¹³⁵
Commentary:	Many of the outages caused by the storms could have been avoided if ENERGEX had an appropriate vegetation management program in place.¹³⁶ The Somerville Report noted that ENERGEX had given a low priority to expenditure for reliability works in the three years before the 2004 outages, and found that ENERGEX's maintenance expenditure has been inadequate over recent years.¹³⁷

Blackout Incident:	Queensland (QLD) / New South Wales (NSW) / Victoria (VIC) / South Australia (SA), 13 August 2004
No. of people affected:	About 250,000 homes in QLD were affected for nearly 2 hours, while industrial users in NSW, VIC and SA were also affected. ¹³⁸
Estimated economic losses:	Figures not available.
Causes:	Explosion in electrical transmission equipment in NSW Hunter Valley. ¹³⁹

¹³⁵ "Electricity Distribution and Service Delivery for the 21st Century" Detailed Report of the Independent Panel, Department of Natural Resources, Mines and Energy, Queensland (July 2004) p 24.

¹³⁶ "Electricity Distribution and Service Delivery for the 21st Century" Detailed Report of the Independent Panel, Department of Natural Resources, Mines and Energy, Queensland (July 2004) p 24.

¹³⁷ "Electricity Distribution and Service Delivery for the 21st Century" Detailed Report of the Independent Panel, Department of Natural Resources, Mines and Energy, Queensland (July 2004) pp 111, 113.

¹³⁸ "Equipment failure blacks out quarter-million Australian homes, businesses" *Associated Press Worldstream* (13 August 2004). "Power cuts create black Friday" *The Courier Mail* (14 August 2004).

¹³⁹ "Beattie calls for review after four state power black out" *AAP Newsfeed* (15 August 2004)

Blackout Incident:	Sweden/Denmark, 24 September 2003
No. of people affected:	4 million people without power for over 6 hours. ¹⁴⁰
Estimated economic losses:	Figures not available.
Causes:	Faults in Swedish power system – a nuclear power plant tripped and a failure in a sub-station then occurred, causing a loss of 20% of Sweden’s electricity capacity to the grid.¹⁴¹ Low reserve capacity, shortage of production capacity.¹⁴² Made worse by the fact that a number of generating units were off-line for maintenance at the time.¹⁴³

¹⁴⁰ World Energy Council, “*Focus on electricity blackouts*”. Available at <http://www.worldenergy.org/wec-geis/focus/blackouts/scandinavia.asp>.

¹⁴¹ Elkraft System Final Report on Power Failure in Eastern Denmark and Southern Sweden (4 November 2003) p 3.

¹⁴² Elkraft System Final Report on Power Failure in Eastern Denmark and Southern Sweden (4 November 2003) p 4.

¹⁴³ World Energy Council, “*Focus on electricity blackouts*”. Available at <http://www.worldenergy.org/wec-geis/focus/blackouts/scandinavia.asp>.

Blackout Incident:	Italy, September 2003
No. of people affected:	57 million ¹⁴⁴
Estimated economic losses:	Figures not available.
Causes:	“Direct cause was the fall of a power lines in Switzerland - when a second line tripped seconds later it caused all lines between Italy and the rest of Europe to trip...however it was also due to already known structural and regulatory issues.”¹⁴⁵ “The underlying causes of the incident...are the unresolved conflict between the trading interests of the involved...operators and the technical and legal requirements for safe and reliable operation of the networks.”¹⁴⁶ “Lack of reserve capacity”¹⁴⁷ “Conflict between trading interests of companies involved and technical requirements of existing system - existing system not designed to cope with deregulation”¹⁴⁸
Commentary:	“Companies are unwilling to spend money on assets where the return is low or uncertain, especially if the market is unwilling to compensate for reliability.”¹⁴⁹ “Many countries in the EU have low reserve generating capacity. This...then leaves less margin in the event of failures.”¹⁵⁰ It has been suggested that Italy was over-dependent on imports.

¹⁴⁴ World Energy Council, “*Focus on electricity blackouts*”. Available at www.worldenergy.org/wec-geis/focus/blackouts/italy.asp

¹⁴⁵ Union for the Coordination of Transmission of Electricity, Press Release (29 September 2003).

¹⁴⁶ Report on the blackout in Italy on 28 September 2003 (November 2003). Available at <http://www.energie-schweiz.ch/imperia/md/content/medienmitteilungen/mm06-122003/89.pdf>.

¹⁴⁷ Hall and Thomas, “*Blackouts: Do liberalisation and privatisation increase the risk?*” PSIRU, University of Greenwich (December 2003) p 8.

¹⁴⁸ World Energy Council, “*Focus on electricity blackouts*”. Available at www.worldenergy.org/wec-geis/focus/blackouts/italy.asp.

¹⁴⁹ Hall and Thomas, “*Blackouts: Do liberalisation and privatisation increase the risk?*” PSIRU, University of Greenwich (December 2003) p 8.

¹⁵⁰ Hall and Thomas, “*Blackouts: Do liberalisation and privatisation increase the risk?*” PSIRU, University of Greenwich (December 2003) p 9.

Blackout Incident:	Midwest and Northeast U.S., and Ontario, Canada, 14 August 2003
No. of people affected:	50 million people affected in 8 U.S. states and parts of Canada. ¹⁵¹
Estimated economic losses:	US\$ 4-10 billion ¹⁵²
Causes:	Tripping of high voltage overhead line in Ohio due to proximity to trees – poor vegetation management. Inadequate system understanding, inadequate situational awareness, violation of North American Electric Reliability Council operating and planning standards by several entities.
Commentary:	“Although the blackouts were caused by a series of technical faults, it has been argued that the underlying problem is lack of investment.”¹⁵³ “A report by the U.S.-Canada Power System Outage task force makes it clear that this blackout could have been prevented and that immediate actions must be taken in both the U.S. and Canada to ensure the electric system is more reliable.”¹⁵⁴

¹⁵¹ U.S. - Canada Power System Outage Task Force “*Final Report on the August 14, 2003 Blackout in the United States and Canada*” (April 2004) p 1.

¹⁵² U.S. - Canada Power System Outage Task Force “*Final Report on the August 14, 2003 Blackout in the United States and Canada*” (April 2004) p 1.

¹⁵³ “*What caused the blackouts?*”, BBC Business News online, 13 August 2003, Available at <http://news.bbc.co.uk/1/hi/business/3153237.stm>

¹⁵⁴ World Energy Council, “*Focus on electricity blackouts*”. Available at www.worldenergy.org/wec-geis/focus/blackouts/usa.asp

Blackout Incident:	California, 2001
No. of people affected:	Figures not available.
Estimated economic losses:	Over US\$50 billion ¹⁵⁵
Causes:	“Supply shortages due to factors such as regulatory impediments to generation and transmission investments and market manipulation and lack of incentives to invest in transmission.”¹⁵⁶ “While there were many causes it was ‘fundamentally a regulatory crisis rather than an economic crisis.’”¹⁵⁷ “Two largest electric utilities went bankrupt after being forced to buy at high wholesale prices and sell at fixed retail prices by law.”¹⁵⁸
Commentary:	“Suggestion that price controls to blame – ‘blackouts are the inevitable result of attempts to regulate and legislate basic economic laws out of existence.’”¹⁵⁹ “It is claimed that the reason that other Western U.S. states didn’t experience the crisis was because they increased prices to consumers.”¹⁶⁰

¹⁵⁵ Lave, L.B., J. Apt and S. Blumsack (2004), “*Rethinking electricity deregulation*”, Electricity Journal 17(8): p 11.

¹⁵⁶ Conference: “*The electricity industry: reliability and the road ahead for Hong Kong*” (29 April 2004) p 17.

¹⁵⁷ Lave, L.B., J. Apt and S. Blumsack, “*Rethinking Electricity Deregulation*” Electricity Journal (2004) 17(8), pp 11-26

¹⁵⁸ Conference: “*The electricity industry: reliability and the road ahead for Hong Kong*” (29 April 2004) p 17.

¹⁵⁹ S Peterson and C Augustine, “*Regulatory failure in the California electricity crisis*” (2003) Electricity Journal 16(7), pp 56-64

¹⁶⁰ S Peterson and C Augustine, “*Regulatory failure in the California electricity crisis*” (2003) Electricity Journal 16(7), pp 56-64

Blackout Incident:	Victoria/South Australia, Jan/Feb 2000
No. of people affected:	Over 1 million ¹⁶¹
Estimated economic losses:	A\$100 million ¹⁶²
Causes:	Load shedding led to mandatory government restrictions on use of power between 1pm and 7pm imposed over one week period in Victoria. South Australia also affected by power shortages. A combination of industrial action, high demand and temporary loss of generating units caused by breakdown at Victorian power stations.¹⁶³
Commentary:	“Although it is unclear, NECA suggests that it is possible that the load shedding that occurred would have been avoided with higher reliability standards.”¹⁶⁴ “Both the Victorian and South Australian governments and NEMMCO faced much public criticism over their handling of the incident, particularly when it later came to light that during the restrictions NEMMCO had sold electricity generated in Victoria to NSW and electricity generated in South Australia was sold to Victoria.”¹⁶⁵

¹⁶¹ Morton T, “*Power games: the politics of electricity*” ABC AM Radio Transcript, (19 March 2000). Available at <http://www.abc.net.au/rn/talks/bbing/stories/s112848.htm>.

¹⁶² Fitzsimmons H, “*Outrage over sale of electricity from Victoria*”, ABC AM Radio Transcript, (11 February 2000).

¹⁶³ NECA, “*The performance of the national electricity market*” (June 2002) p 85.

¹⁶⁴ NECA, “*The performance of the national electricity market*” (June 2002) p 85.

¹⁶⁵ See, for example, H Fitzsimmons, “*Outrage over sale of electricity from Victoria*”, ABC AM Radio Transcript (11 February 2000).

Blackout Incident:	Auckland, February 1998
No. of people affected:	1 million ¹⁶⁶
Estimated economic losses:	Tens of millions ¹⁶⁷
Causes:	Failure of power cables. ¹⁶⁸
Commentary:	Under-investment in transmission blamed. ¹⁶⁹ “6000 residents living in apartments forced to move out for the 3 week period, 60,000 city workers forced to work elsewhere - caused widespread disruption and chaos.” ¹⁷⁰

¹⁶⁶ Melhuish, M, Sustainable Energy Forum, Presentation, NZ Energy Conference (7-8 October 2002).

¹⁶⁷ “Power failure brings New Zealand’s largest city to a standstill” CNN world news (24 February 1998), <http://www.cnn.com/WORLD/9802/24/nzealand.blackout/index.html>

¹⁶⁸ “Power failure brings New Zealand’s largest city to a standstill” CNN world news (24 February 1998). Available at <http://www.cnn.com/WORLD/9802/24/nzealand.blackout/index.html>

¹⁶⁹ Melhuish, M, Sustainable Energy Forum, Presentation, NZ Energy Conference (7-8 October 2002).

¹⁷⁰ “Power failure brings New Zealand’s largest city to a standstill” CNN world news (24 February 1998). Available at <http://www.cnn.com/WORLD/9802/24/nzealand.blackout/index.html>

Appendix 2 - Cost of regulation in overseas markets

I Set-up costs

Market restructure, deregulation or the introduction of major regulatory changes require substantial set up costs that result from the creation of new organisations, investment in new hardware and software and changes to operational systems. The following figures provide specific examples of the set-up costs associated with overseas electricity market reform.

Canada

Ontario Market Restructuring - total cost of over C\$1 billion¹⁷¹

Cost of establishing the Independent Market Operator - C\$300 million

Cost of establishing Ontario Power Generation- C\$100 million

Cost of establishing local distribution companies - C\$600 million

U.S.

Set-up costs in California were US\$ 500 million.¹⁷²

Australia

Set up costs for NEMMCO totalled A\$50 million, and A\$3.5 million was spent on establishing NECA.¹⁷³ In the 2003/04 financial year NEMMCO received A\$53,700,292 in fees from market participants to offset the establishment costs, of which a \$21.4 million debt remains.¹⁷⁴

The total cost of setting up a system for full retail contestability in Australia was A\$ 100 million.¹⁷⁵ Of this, a \$39 million debt still remains.¹⁷⁶

It is estimated that the total cost of the new Australian Energy Regulator (established in July 2004) will be A\$10.7 million, and the government has allowed \$8.4 million total towards set up costs in the 2004-05 budget, with \$1.9 million for up-front capital costs.¹⁷⁷

¹⁷¹ Woo et al, (2005) "Costs of electricity deregulation", Energy – The International Journal, forthcoming, p 5.

¹⁷² "The Electricity Industry: Reliability and the Road Ahead for Hong Kong", transcript from conference, Session 1 (29 April 2004).

¹⁷³ Final Determination - Application for ACCC authorisation to change the National Electricity Code, p 10.

¹⁷⁴ NEMMCO Annual Report 2003-04, pp 2,39.

¹⁷⁵ "The Electricity Industry: Reliability and the Road Ahead for Hong Kong", transcript from conference, Session 1 (29 April 2004).

¹⁷⁶ NEMMCO Annual Report 2003-04, p 2.

¹⁷⁷ Australian Government budget 2004-05, Portfolio Budget Statements – Treasury, ACCC, Section 2.

II On-going regulatory costs

In Australia it has been estimated that the total annual cost of regulation in terms of employees and consultants for the electricity generation, distribution and transmission sectors is over A\$88 million.¹⁷⁸ The following figures provide some indication of the costs associated with the various aspects of regulating overseas electricity markets.

A. Independent system operators - annual expenses¹⁷⁹

Ontario, CA - C\$212 million

California, U.S. - US\$198 million

Midwest, U.S. - US\$119 million

New England, U.S. - US\$103 million

New York, U.S. - US\$116 million

PJM, U.S. - US\$247 million

Fingrid, Finland - €152.7 million

Elkraft, Denmark - DKK3,108.2 million

Elxon, U.K. - £65.5 million

B. Economic regulators

The U.S. FERC had an annual budget of US\$52 million for electric power activities in 1998.¹⁸⁰ State regulatory commissions also had large annual expenditures, for example¹⁸¹:

California - US\$77 million

New York - US\$52 million

Pennsylvania - US\$31 million

¹⁷⁸ Moran, A, "Paperburden Costs of Economic Regulation of the Gas and Electricity Supply Industry" (2003) APIA Submission to the Productivity Commission, Energy Issues Paper No 29, p 3.

¹⁷⁹ North American costs based on 2002/2003 data. See Woo et al, (2005) "Costs of electricity deregulation", Energy – The International Journal, forthcoming, p 5. Fingrid costs see 2004 Annual Report, p 26, Elkraft Costs see 2005 Operating Budget, <http://eng.elkraft-system.dk/C1256C090032B149/Financial%20aspects/4CE769A846E31DEDC1256FC40049BAEE?OpenDocument>, Elxon, see Annual Budget 2004-07, p 7.

¹⁸⁰ International Energy Agency, "Regulatory Institutions in Liberalised Electricity Markets" (2001), p 93.

¹⁸¹ Data relates to expenditures in the early 1990s, Philips, C., "The Regulation of Public Utilities: Theory and Practice (1993)" Table 4-2. Note that these commissions are also responsible for regulating a range of other industries, such as gas, water and telecommunications.

Virginia - US\$37 million

Australian state regulators also face large annual operating expenses¹⁸²:

Independent Pricing and Regulatory Tribunal NSW (IPART) - A\$15,741,000

Essential Services Commission of South Australia (ESCOSA) - A\$4,470,000

Essential Services Commission of Victoria (ESC) - A\$12,935,609

Australian federal government agencies with explicit regulatory functions employ around 30 000 staff and in 2001-02 spent approximately A\$4.5 billion.¹⁸³

A study measuring the cost to the Australian government of regulatory authorities administering the Gas Access Regime found that the total cost of industry regulation was between A\$16.7-18.8 million per annum, with a cost of over A\$5.4 million for access arrangements alone.¹⁸⁴

C. Licence fees and regulators' costs paid by system participants

Regulators' costs are typically recovered through licence fees levied on the regulated businesses. As the following figures indicate, these fees are substantial, and the costs are ultimately passed on to consumers through rising tariffs.

ESCOSA received A\$8.97 million (of total income of A\$9.78 million) in the form of licence fees from electricity/gas operators. Of these, electricity generators, transmitters, distributors and retailers paid A\$6,203,100 altogether in licence fees.¹⁸⁵

ICRC received A\$1.419 million in licence fees from utilities in 2003/04.¹⁸⁶

In 2002-03 Envestra paid annual licence fees of A\$1.1 million and A\$1.2 million for the use of the South Australian and Victorian gas networks respectively.¹⁸⁷

Epic Energy paid A\$2.5 million to regulators for the Dampier-Bunbury pipeline access arrangement process, as well as an addition A\$2.5 million in consultants' fees, while NT Gas spent half a million dollars on the access arrangement process for the Amadeus Basin-Darwin pipeline.¹⁸⁸

¹⁸² 2003-04 Annual Reports of IPART (p 23), ESCOSA (p 39) and ESC (p 58). These regulators are responsible for regulating a number of services (e.g. electricity, gas, water, rail, ports and grain in Victoria) however figures relating to expenditure on particular areas are not available. A large part of the costs are associated with the electricity sector, see above figures re licence fees paid by electricity market participants.

¹⁸³ *Review of the Gas Access Regime*, Productivity Commission Inquiry Report (11 June 2004) p 147.

¹⁸⁴ *Review of the Gas Access Regime*, Productivity Commission Inquiry Report (11 June 2004) p 148.

¹⁸⁵ ESCOSA Annual Report 2003-04, pp 39, 41.

¹⁸⁶ ICRC Annual Report 2003-04, p 53.

¹⁸⁷ *Review of the Gas Access Regime*, Productivity Commission Inquiry Report (11 June 2004) p 145.

¹⁸⁸ *Review of the Gas Access Regime*, Productivity Commission Inquiry Report (11 June 2004) p 145.

D. Administrative and other costs

In U.K., Ofgem administrative costs in 2003/04 totalled £37.2 million.¹⁸⁹

In Australia, ESCOSA engaged consultants, contractors and external lawyers to the value of A\$1.219 million during 2003-04.¹⁹⁰

NECA administration expenses totalled A\$1,026,820 in the 2003/04 financial year, and A\$509,624 was spent on consultants' fees.¹⁹¹

ICRC's ordinary operating expenses were A\$3,410,000.¹⁹²

¹⁸⁹ OFGEM 2003-04 Annual Report p 51.

¹⁹⁰ ESCOSA Annual Report 2003-04, p 42.

¹⁹¹ NECA Annual Report 2003-04, p 34.

¹⁹² ICRC Annual Report, p 67.