

ACHIEVING ENVIRONMENTAL GOALS IN A COMPETITIVE  
ELECTRICITY MARKET?: POST-COLONIAL HONG KONG,  
PUBLIC CHOICE AND THE ROLE OF GOVERNMENT

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# ACHIEVING ENVIRONMENTAL GOALS IN A COMPETITIVE ELECTRICITY MARKET?: POST- COLONIAL HONG KONG, PUBLIC CHOICE AND THE ROLE OF GOVERNMENT

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## ABSTRACT

This paper critically assesses the discourse of electricity market liberalization in Hong Kong, China and makes policy recommendations from an environmental perspective. For both economic and environmental reasons, local advocates urge for an immediate opening of the electricity market currently monopolized by two private companies. Their neglect of the fact that a competitive green power market is a function of adequate public support in the form of market demand may place the environmental agenda at a disadvantage. Given that environmental issues are yet a dominant concern in this growth-oriented economy, a new facilitative role of the government is of particular importance to prevent the market from being dominated by short-term, rational economic behaviours. Mild changes with an emphasis of a transformation in the roles of different players, which the government is hesitant to initiate, are suggested.

**Keywords:** Electricity policy, Environmental policy, Sustainable development, Hong Kong.

## 1. INTRODUCTION

Electricity policy was no more than an economic topic in Hong Kong for decades. Liberalization of its electricity market has become a hot issue during past few years because of the evident inconsistency between the obsolete regulatory model and the changing public needs. Decline of the city-wide air quality has prompted the criticisms on the minimal environmental benefits associated with the monopolistic status of the two local private electricity providers. Majority of the actors except the power companies advocate the liberalization for various reasons, including a political one, as the debates have manifested as a part of the political movement in

such a not-yet-democratic society. Their philosophy is that the monopolization of the electricity industry is invariably a major cause of all problems and, as a corollary, the reverse would offer the solutions. This presumption is simplistic in the sense that it mechanically reduces the problem to a reversible equilibrium that is inadequate to address the complicated, multidimensional nature of electricity provision. Prior to an informal agreement reached in early 2008, there existed a tension between the electricity regulator and the two power companies. The government faced a difficult decision as reflected by its hesitant attitude towards restructuring of the market as expressed in the two issues of public consultation papers about the electricity market reform in Hong Kong. It has been suggested that transformation to a more sustainable energy systems demands an integration of the diverse interests, which sometimes involve irresolvable conflicts among themselves. The purpose of this paper is to identify the limitations underlying an electricity market liberalization plan and make policy recommendations for the ways forward. It adopts an environmental perspective and comments on the potential demand-side response, with an emphasis of the role of government in facilitating a bottom-up management approach.

## **2. BACKGROUND**

Hong Kong hosts a population of nearly 7 million people as at 2007 with an area of about 1100 km<sup>2</sup>. The tiny city was under British colonial control until its sovereignty and administration was returned to the People's Republic of China in July 1997. The economy grew rapidly since the 1960s. From 1997 onwards, however, like its Asian counterparts, it suffered from serious economic difficulties during the time of the Asian financial crisis. To date, the economic conditions have recovered from the downturn as revealed in its per capita GDP peaked at US\$27,600 in 2006, growing from the ten-year bottom of US\$23,500 in 2003.

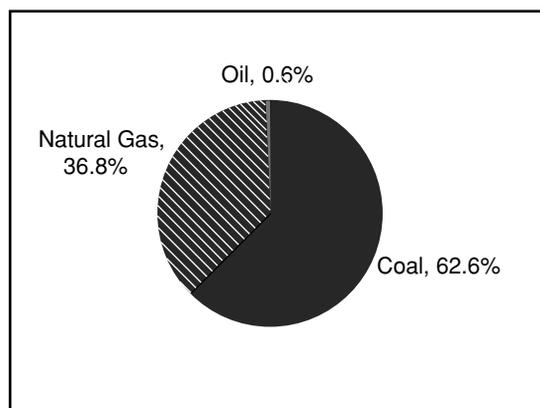
### **2.1. Electricity Supply and Demand**

Electricity generation plays an important role in the energy economy of Hong Kong; it consumes about half of the fuel imports throughout the last two decades. Until 1981, electricity supply in Hong Kong was generated entirely from oil products which were subsequently substituted by coal in 1982 for cushioning the growing economy against the fluctuations in energy prices. Although coal-fired power plants were generally more polluting than oil-fired plants, it was not an issue of serious concern to the colonial administration [1]. The changes in the level of electricity generated in Hong Kong are inseparable from the growth pattern of the economy. As shown in the Table 1, it is rising along with the GDP level during the last two decades. The fact that nuclear power was imported from Guangdong as an alternative energy source from 1994 and natural gas was also introduced for electricity generation two years later accounted for the decline of local electricity production in the mid-1990s. Currently, the fuel mix consists of coal as the major energy source, followed by an increasing share of the relatively less polluting natural gas (Figure 1). The majority of coal imported to Hong Kong come from Indonesia (89.6%), followed by China (7.2%) [2]. All fuels are imported.

**Table 1: Comparison of local electricity production to the GDP growth of Hong Kong, 1986 – 2005**

Year	Electricity generated at local plants (million kWh)	% Change (base year 2000)	GDP (million HK\$) (At constant (2000) market prices)	% Change (base year 2000)
1986	21,419	68%	646,399	49%
1987	23,754	76%	733,054	56%
1988	25,508	81%	791,649	60%
1989	27,363	87%	813,176	62%
1990	28,960	92%	845,515	64%
1991	31,889	102%	893,625	68%
1992	35,076	112%	951,270	72%
1993	35,948	115%	1,011,492	77%
1994	26,741	85%	1,068,193	81%
1995	27,916	89%	1,110,086	84%
1996	28,440	91%	1,156,923	88%
1997	28,943	92%	1,216,102	92%
1998	31,414	100%	1,149,662	87%
1999	29,496	94%	1,195,624	91%
2000	31,329	100%	1,314,789	100%
2001	32,429	104%	1,323,167	101%
2002	34,312	110%	1,347,495	102%
2003	35,506	113%	1,390,610	106%
2004	37,129	119%	1,510,182	115%
2005	38,448	123%	1,619,984	123%

Source: Census and Statistics Department, Hong Kong Statistics.



Source: International Energy Agency website (visited 13 February 2008)

Figure 1: Fuel inputs in electricity generation in Hong Kong 2005.

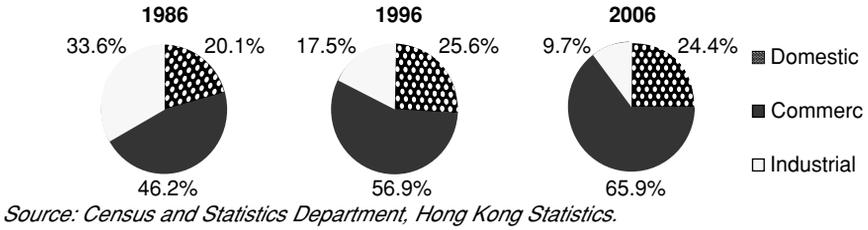


Figure 2: Sectoral Consumption of electricity in 1986, 1996 and 2006.

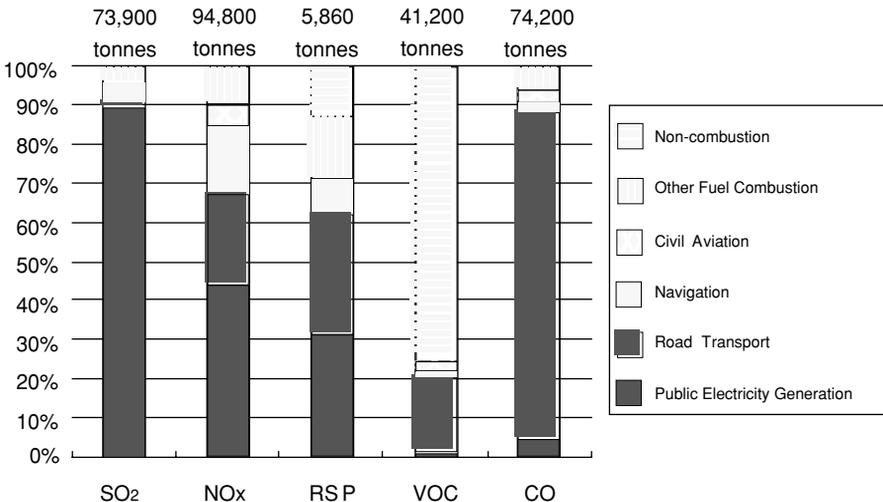


Figure 3: Emission Inventory of Hong Kong 2006.

Likewise, the electricity consumption is closely linked to the structural change of the economy during this period, generally increasing with the rapid development of the economy. In addition, the pattern of sectoral consumption has undergone substantial change during this period, with the share of industries declining while commercial sector rapidly rising (Figure 2). This coincided with the transformation of the economic structure over this period which was characterized by the relocation of the manufacturing sector to the Pearl River Delta Region and the growth of tertiary industry. The gentle increase in domestic consumption could be attributed to the trend of electrification in the household following the rising income levels together with the growing demand for higher comfort levels [3].

Since the late 1980s, mitigation of the electricity-related environmental problems has been given a place in the policy agenda of the colonial government. It was initially

written in the White Paper published in 1989 under a subsection of 'Air Pollution'. In 1980s the air pollution problem largely came from local industrial emissions, but it still remains as a major threat even majority of the industries have relocated to Mainland China. A reason to this is transboundary movement of air pollutants originated from the industries in the Pearl River Delta Region in Southern China. Currently, poor air quality is considered as a pressing environmental problem in Hong Kong due to the growing concerns about its health impacts. Sources of the various air pollutants are given in Figure 3, which shows that while power plants are the major source of SO<sub>2</sub>, road traffic contributes to the CO emission on the other hand. Although the local power companies have implemented a number of environmental initiatives to mitigate emissions, it is more or less offset by the increasing level of air pollutants from the Pearl River Delta Region.

## **2.2. Regulatory Institutions**

Local organizational arrangements that govern electricity issues have demonstrated some degree of division of labour between several government departments and quasi-official organizations. The role of regulator of the electricity policy is principally represented by the Economic Development and Labour Bureau (EDLB)<sup>1</sup> which is designated to ensure the energy needs of the community to be met. Another key player is the Environment, Transport and Works Bureau (ETWB)<sup>2</sup> / Environmental Protection Department (EPD) which play a key role in actively managing electricity-related environmental problems. The Electrical and Mechanical Services Department (EMSD), on the other hand, serves to provide technical support for the manipulation of energy policy, including safety issues and energy efficiency programmes. Apart from these, there are two advisory bodies involving in the energy policy community, namely, the Energy Advisory Committee for providing advice on energy policy and the Council for Sustainable Development for promoting sustainability strategy in Hong Kong, with the promotion of renewable energy identified as an area of particular concern under the First Sustainable Development Strategy for Hong Kong [4].

Currently, there are only two privately owned electric utilities: CLP Power Company Limited (CLP) and Hongkong Electric Company Limited (HEC). They are regional monopolies allowed, but not franchised, to supply electricity in their respective areas of Hong Kong without direct competition. Their local electricity businesses are individually subject to a rate-of-return regulatory arrangement known as Scheme of Control Agreements (SCAs). Major financial arrangements of their businesses like levels of permitted rates of return (which were, until 2008, 13.5% and 15% on their average debt-financed net fixed assets and equity-financed assets respectively) and tariffs are subject to the provisions of SCAs, while at the same time the companies are required to provide reliable and adequate electricity services to the economy at reasonable prices. Although the SCA is not an exclusive franchise, no new

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<sup>1</sup>Its role as the regulator had been transferred to the newly established Environment Bureau.

<sup>2</sup>The ETWB has been reorganized and renamed as Environment Bureau in July 2007.

power producer has ever entered into the market because the transmission grids are exclusively owned and operated by the companies. The existing SCAs run for 15 years and will expire in 2008; however, according to the government's announcement, the new one will be shortened to 10 years. Yet, such an extension of the agreements fails to put an end to the criticisms from the concerned parties, especially the political parties and environmental NGOs, for its inadequacy to address economic and environmental efficiencies.

Hong Kong's economy is characterized by a *laissez-faire* model which has been vividly printed on its electricity policy framework. The management philosophy of 'positive non-interventionism' developed by the British colonial government led to the convention of minimal involvement by government officials in economic aspects of power industry. There is little direct intervention over the power companies' operation. The regulation mainly includes a series of standards, limits or caps, such as the permitted rates of return, to enable self-adjustment by the power companies. It was believed effective to save bureaucratic resources in monitoring and assessing their performance by employing clear, predetermined benchmarks for the authorities to determine compliance, which were regarded as a substitute to an integrated energy bureau or department that never exists in the territory. The power companies are thus more or less free from close scrutiny as long as they do not go beyond the predefined boundaries.

The non-interventionism did not extend to the environmental regulation [5]. Counting from 1990s, the government has developed a series of policy initiatives with mixed results; the major ones are summarized by the EPD as below:

- Requiring the power companies to use the best practicable means to reduce emissions as required in the Air Pollution Control Ordinance (APCO) and at the same time enhance the operational efficiency of the power plants and the combustion and generation efficiencies;
- Requiring the power companies to use low sulphur coal for all the existing coal-fired generating units;
- Banning the construction of new coal-fired generating units since 1997;
- Setting emission caps in any Specified Process Licenses (SPLs) issued or renewed to power companies under the APCO; and
- Encouraging the power companies consider adopting the most effective economic tools (including emissions trading) to achieve the emission reduction targets. [6]

Other than the APCO, environmental legal requirements are also defined by the Environmental Impact Assessment Ordinance, Noise Control Ordinance, Waste Disposal Ordinance, Water Pollution Control Ordinance, etc. Although the environmental officers have achieved some degree of success regarding technical aspects, environmental goals, on the other side, were poorly integrated into the economic regulation until very recently. Despite the government has been aware of the urgency of incorporating more stringent environmental regulations into the post-2008 SCAs, the history of its electricity policy suggests that it had been completely ignored for many years. The policy was handled as a purely economic one by the

economic bureau, and the SCA was to a large extent isolated from sustainability principles. The addition of a powerless provision about environmental obligation in the SCAs during 1990s was yet followed by an enforceable environmental requirement. So, presently (2007) there is no provision to obligate or encourage the two power companies to generate electricity from renewable energy sources. While the government plans to make some changes to policy framework as a remedy, what is central to the question is the manner in which it will be reconstructed, given that the 'hidden agenda' that the government is actually not willing to immediately open the power market for the sake of economic stability is at odd with the rapidly rising public aspiration for a thorough reform.

### **2.3. Electricity Market Reform**

In 2005, a restructuring of the power market was proposed by the government as the current agreements are about to expire. As a commitment to increase public participation as well as a political need, the EDLB launched a two-stage public consultation exercise in the same year to involve the public in the discussion of various issues and possible options on the future development of the electricity market [7, 8]. In general, the recommendations made by the EDLB include a relaxation of the constraints of introducing new power supplies and imposition of tougher regulatory controls over the two power companies. The focus of the debate virtually fell around the desirability of electricity market liberalization as it would profoundly affect people's living. People who support increasing competition stressed the potentials of higher economic efficiency in power generation [9–11] or of improving environmental performance [12–14], or both [15]. Concerns on the possible economic impacts [16, 17] and the complexity of the regulatory framework required [18] constitute the conservative arguments on the other hand.

While the negotiation was initiated in the 1990s, the written proposal on electricity market reform was issued no more than two years after 2003 — the year when the unwelcome administration was suffered from a harsh political climate due to a series of policy failures, prompted by the unprecedented mass protest by half a million people on July 1 of this year. The resignation of Tung Chee-hwa, the first Chief Executive of Hong Kong SAR Government, in March, 2005 was in fact a consequence of the increasing criticisms over his administration that prompted the huge protests. This invariably put the government in a dilemma: if it opened the power market shortly after 2008, it might run a risk of compromising the private interests of the power companies and the weak economy might also suffer from less stable power supply which is always a key concern of all parties; but if did not it might also be rigorously attacked by the angry public. Eventually the government made a compromise — extending the SCAs without breaking the monopolistic structure of electricity market while tightening the environmental regulations with the use of 'command-and-control' and economic initiatives. These include the emission caps mentioned above and an adjustment of the permitted rates of return (i.e. the rate of return for acquired assets is reduced to 9.99% while allowing a higher rate of 11% for rewarding the use of renewable energy for power generation).

### **3. PROSPECTS OF A COMPETITIVE ELECTRICITY MARKET**

As a global trend, there seems to have no more excuse to protect the power market from competition. However, the author is of the view that the Hong Kong government's decision to defer the liberalization plan is not bad idea. It is often said that market liberalization can promote cleaner power production process, but there is a case that a deregulated market would disappoint the planners who have made little considerations to the pre-conditions needed for this statement to come true. This section first briefly goes through the opportunities before elaborating the observed barriers currently existing in Hong Kong.

#### **3.1. Opportunities**

Building more power plants in Hong Kong is infeasible given its geographical limitation, but cross-border supply may have the potentials to feed Hong Kong with electricity generated from standard or renewable sources. Technical barriers are unlikely a problem here, on a condition that the interconnection between the CLP and HEC is sufficiently enhanced. The consultancy report added that the electricity sector in Southern China may have the capacity to support a competitive wholesale market with sufficient number of entities in Hong Kong, especially by hydroelectric generation [19].

It is often suggested that in a competitive market, utilities would be encouraged, if not forced, to adopt various innovative activities in accordance with their commercial interests in order to squeeze more profits for survival. This rule of thumb would be in favour of environmental innovation as long as it earns them money. Open utility market has some institutional or market barriers eliminated. Utility providers, who now exclusively act on commercial interests, will be motivated to offer environmentally friendlier options to the most conscious consumers who are willing to pay a premium for enjoying more sustainable supply [20, 21]. Coupled with improved technological capabilities, market liberalization is considered as playing a crucial role in strengthening this interdependency; it displays the market niche in which utility providers can capture new business opportunities by innovating and differentiating their systems of provision based on different 'levels' of environmental friendliness [21]. Environmentalism, therefore, can find its place in the economic market.

In a similar vein, Guy and Marvin [22, 23] have examined the role of a Demand-Side-Management (DSM) approach emerging along with the growing trend of utility market liberalization. They find that it can bring about demand-oriented initiatives as the utilities are continuously under a market pressure to develop more innovative, customized strategies for capturing customers and holding on to them. To this point, it has no difference from other commodities because "If there is some money to be made and a willing buyer and seller, then someone...will figure out a way to make it happen...That is how markets work" [24]. Market dynamics is regarded as something to connect the interests of the willing providers and consumers, which are departed in conventional monopolistic, government-led mode of provision.

Basically, most of the environmentalists and politicians in Hong Kong held this view firmly when arguing in the debate. From an environmental point of view, the major benefit of competition is wider range of customer choices which should be able to more

adequately support a green power market normally overshadowed by the standard market. Experiences in the U.S. suggested that retail competition is able to create market niche wherein customers can obtain green power products by paying a premium [25]. Local environmental groups, e.g. [26], are confident with this since it appears that such market may perhaps exist in Hong Kong, grounded on the high household's willingness-to-pay reflected in a survey that there are 40.5% of household willing to accept a 10–15% increase in tariff for using renewable energy [27]. In addition, a more flexible pricing system in a deregulated market may help build up a funding mechanism for cost recovery, which is what Hong Kong urgently needs in order to promote the use of renewable energy as indicated by another consultancy report [28].

### **3.2. Potential Barriers**

This positive outcome, however, have been presumed by the advocates as automatic. It is argued that they have misinterpreted the data to different extents and are ignorant of the necessary new role of the regulator. Like the process of democratization everywhere, the proposed market liberalization plan would possibly encounter more difficulties than expected due to the rational behaviors of individual consumers.

One of the barriers comes from the actual priority of environmental goals when the prevalence of consumers' short-term behaviours is taken into account. Hong Kong people are notorious for their low environmental awareness (though rising). To what extent renewable energy is received by the users is a matter that the advocates have not adequately addressed. It appears that Hong Kong people are willing to pay a surcharge for renewable energy, but it may probably not hold if reliability and tariff issues remain as an overriding concern, given their relatively low level of knowledge and understanding on renewable energy [28]. It is one thing to ask for support for subsidizing renewable energy but it is another when putting reliability and tariff issues on the table as well. Environmental goals are vulnerable in a strongly competitive market in the absence of policy intervention, as illustrated by the energy crisis in California during 2000–2001.

The state of California, after rapidly fully opening its electricity market, witnessed a power crisis of severe power shortage and historically sharp increase and high volatility in electricity prices. The electricity supply systems were criticized for being irresponsible to the demand sides, as the utilities were restricted to pass the increase in tariffs to their customers due to a rate freeze that prevents consumers from responding to the price movements [29, 30]. Conflicts between reliability, rates and the environment were sharpened [31]. The state government faced a difficult choice when they found that it was impossible to avoid at the same time all the three problems, namely, rising power prices, decreasing reliability and environmental degradation. Severe economic drawbacks were eventually rated more important by the decision makers, who therefore chose to put lower priority to environmental improvement than the other two when taking remedial actions. According to Gamson [31], it was the unlimited market power exercise and the inadequate effective regulatory oversight that had caused the chaos and put the peripheral goal of preventing environment degradation in a dead end. Power companies of Hong Kong shares a similar view with the California state government regarding the economy-environment relationship, i.e.

**Table 2: Aspects of electricity supply considered to be the most important by the Hong Kong consumers**

Aspect of electricity supply considered to be the most important	Domestic consumers	Commercial and industrial consumers
Reliable and stable electricity supply	49.7%	57.8%
Low electricity tariff*	34.5%	15.6%
Availability of choice of electricity suppliers	6.8%	13.5%
Good customer services	3.8%	4.9%
More environmentally sustainable energy sources*	3.7%	4.2%
Simple tariff structure	1.6%	4.0%

Sources: Domestic: Census and Statistics Department, *Thematic Household Survey Report No. 17* [27]; Commercial and industrial: EDLB, *Electricity Supply in Hong Kong: Establishment Survey* [35].

\*The survey for commercial and industrial consumers used different wordings but with similar meanings — ‘reasonable electricity charges’ and ‘choice of electricity produced by renewable energy sources’ respectively.

there is a zero-sum game between these two aspects [32]. In both US and Hong Kong, environmental goals virtually fall miles behind economic pursuit in the government agenda. It will damage the prospect of environmental sustainability if Hong Kong follows a hands-off approach as the U.S. did when these two goals are put on the table. Encouraging the ‘invisible hand’ to take over all the functions previously performed by the regulators is an unrealistic belief. As the stability and quality of power supply from Mainland China remains questionable, it may also run the same risk if the deregulated market is still preoccupied by a belief of economy-environment tradeoff — something that does appear in its version of sustainable development [33, 34].

As a matter of fact, substantial support from the Hong Kong people for renewable energy is minimal. In a survey, the respondents ranked a more environmentally benign supply option exceedingly lower than reliability and tariff issues (Table 2). Since electricity generated from renewable energy sources in Mainland China is generally perceived by the locals as less stable (in consistent with their general perception about Chinese products) and more expensive, it may be marginalized in such society preoccupied by economic rationality as Hong Kong. Price effect will become significant as the price differential gets wider. Under competitive market condition, price reduction in standard electricity is normally greater than that of renewables [36]. Exclusive focus on prices runs a risk of putting the use of cleaner energy sources and technologies at a disadvantage. As such, it is argued that there exists a social trap that the short-term economic interests compete with long-term environmental goals, undermining the effectiveness of an opening. Success of environmental innovations depends on the existence of strong market demand. Despite electricity market liberalization can open the door to renewable energy supply at one end, it may fail to secure adequate demand at the other, when the household’s economic concerns are too strong to allow a cleaner environment. Potentially there is a gap between the supply and demand.

A market mechanism known as Non-Fossil Fuel Obligation (NFFO) was established in the U.K. to promote renewable energy [37]. It was introduced in 1990 to oblige the public electricity suppliers to buy a specified capacity from specified renewables, such as wind, hydro power or landfill gas, at a premium price through competitive bidding procedures. The NFFO contracts were awarded to the cheapest bids on a competitive basis. The regional electricity companies (RECs) pay the contracted premium price at, for example, 4 pounds/kWh, for the NFFO generation to the NFFO generator, but are required to purchase the renewable generation at the market price (i.e. average monthly pool selling price), such as 2.8 pounds/kWh. Difference between the premium price and the average monthly pool selling price was reimbursed by the Non-Fossil Purchasing Agency to the RECs, and was paid for by a Fossil Fuel Levy which was in turn paid for by consumers in the electricity bills. It has achieved a certain degree of success and was generally accepted by the RECs as they could buy the NFFO renewable electricity at a lower cost [37, 38]. By making use of market force it helped contribute to the promotion of renewable energy in a competitive environment. There is thus a lesson for the government of Hong Kong about collecting funds regularly from the public to subsidize renewable energy. When initially moving from a centralized to a more competitive electricity supply system market signals from the government to ensure that it will not compromise environmental objectives become necessary. Such mechanism as the Fossil Fuel Levy to mandate financial contributions to support the endeavour would be helpful. Hong Kong developed its environmental policy-making system based on the British governance tradition, which was a centralized one; it is likely that Hong Kong will face similar problems at the beginning of the reform, such as those in balancing short-term market interests and social goals. Experiences from the U.K. on how to make use of market force while maintaining a certain degree of control may therefore be useful to inform the power market reform. However, while trying to minimize the burdens to the people to avoid any political shocks, the Hong Kong government is hesitant to redistribute the responsibility between the power users and producers as the issue has been largely politicized.

Market liberalization may also hurt the adoption of energy efficiency activities which are vulnerable to low electricity prices. Utility-sponsored DSM initiatives would likely suffer because of the cost-cutting strategies of the utilities struggling in a more competitive environment [39].

In fact, since the market deregulation started in some U.S. states in 1992, their electric utility DSM program expenditures have shrunk dramatically. According to the U.S. Energy Information Administration, the total DSM expenditures peaked at US\$2.8 billion in 1993 but dropped to US\$1.6 million in 1997. Undoubtedly, a natural consequence of introducing competition is that utility-sponsored DSM becomes no longer economically attractive to the utilities. When the removal of regulation puts an end to the assurance of fixed rate of return, the utilities are forced rigorously compete with each other with cheaper prices. This invariably restricts them from passing DSM costs to their customers and creates weaker incentives for the utilities to operate DSM programs, because a successful case will adversely affect sales and profits as well.

Decision makers of Hong Kong are reminded that the promotion of energy efficiency in a competitive market is profoundly difficult without governmental subsidizing measures to assist the market. The U.S.'s approach is worth considering as it has rich experience in implementing DSM which Hong Kong plans to follow. In the US a mechanism known as 'public benefits fund' or 'system benefits charge' is widely adopted; it is a non-bypassable levy paid for by ratepayers and included in their bill and used to fund energy efficiency activities and development of renewable energy sources for the common good. Swisher and McAlpin's [40] study reveals that there is greater improvement in energy savings in those states with such an initiative. This shows that in order to offset the disincentives arising from liberalization, novel forms of policy intervention are necessary to enable the market to encourage as well as to finance DSM activities [41]. A government-mandated tax or levy imposed on all energy service providers may help create a customer-driven basis for these initiatives, it may be, however, too early to expect this in Hong Kong given the people's low preparedness to commit (more than the awareness to commit). The fact that the local taxpayers who have been depressed by the government performances during the past few years are very sensitive to upward tariff movements also places the government in an inappropriate position to talk about money matters.

### **3.3. Lessons to Hong Kong**

It is likely that the development of an environmentally sustainable power market in Hong Kong will be limited by the weak support from the public sphere and the lacking of political commitment to undertake meaningful facilitative initiatives to support the market. As long as this situation applies, the liberalization of the electricity market in short or even medium terms will make little environmental sense. It should be noted that the citizens' environmental awareness has no necessary linkage to their corresponding actions, i.e. value-action gap. The public concerns about the environment manifested in the Stage I and II Consultation processes may reveal the participants' awareness, but the conclusion that this is indicative of a potentially viable competitive green power market seems to have underestimated the complexity and ambivalence in their wide-ranging views expressed. Electricity issues are often entangled with diverse interests and the involvement of too many actors who are exclusively concerned about their individual interests would exacerbate the problem. From the development history of Hong Kong it can easily be observed that the people often tend to act like rational economic individuals, or 'consumers', more than 'citizens'. And this view applies to energy issues without exception. This is not in favour of a competitive green power supply market which is ultimately driven by customers' actual contributions (e.g. by paying a premium, re-routing consumption practices, etc).

Also, free market normally tends to prioritize short-term interests. It enables stronger interaction between sellers and buyers for economic goods; but for protecting long-term environmental interests, proper policy signals are required to guide the market. Fouquet [36, 42] argues that there is a case for government to influence demand such that demand balances supply. However, the government of Hong Kong seems unaware of the need to facilitate a relationship between the private utilities and

the consumers that is conducive to sustainable energy production and consumption. The local officials are reluctant to make big changes and foster in an innovative manner a more positive interaction between the two parties which is found elsewhere to be a crucial element in the emerging green power market [20, 21]. Following the British governance tradition, the 'small government' is not prepared to take up a new role of a facilitator state [33]. If the government has no idea of its new role but simply opens the market for the sake of providing wider range of energy choices, it would probably hurt the society as the uncontrolled intense competition may put environmentally benign energy products or services at a disadvantage rather than an advantage. While all the people have focused on the guilt of the faulty SCAs, the limitations of deregulation have been unnoticed in the overheated debate.

#### **4. RECOMMENDATIONS**

While full liberalization in short term remains questionable, a more appropriate approach would be re-regulation with a facilitative role of government, revised policy processes and new policy instruments. Basically, it has to be decentralized and consumption-focused, while not excluding the possibility of market opening in medium-to-long term. A few recommendations to Hong Kong are made as below.

##### **4.1. Strengthening the Organizational Relations**

###### *4.1.1. Establishing an Integrated Regulatory Authority*

In Hong Kong, fragmentation of the organizational arrangements constitutes a major problem of its energy policy, given the absence of an integrated energy bureau. This gives rise to weak co-ordination between the energy-related policy initiatives of different government departments. There is a need for the government to set up a separate regulatory body for the formulation of a more integrated set of energy policies. The main purpose is to integrate the conventional economic regulation with social regulation with respect to energy issues. Social regulation aims to protect social interests, including the environment; it primarily concerns with correcting externalities or information problems [43]. Unlike the EDLB and EPD, this energy authority should exclusively focus on energy issues based on multiple criteria. In particular, it should be designated to embody dual considerations on economic and environmental interests by, for instance, linking permitted return to the utilities' environmental performance and assessing the possible environmental impacts of tariff adjustment. Also, it should be established as an independent public body empowered to regulate various aspects of the industry, sharing regulatory activities with other public entities, notably the EDLB, and possessing judicial powers like setting penalties for non-compliance or acting as an arbitrator in disputes. For long-term social interests, the scope of regulation of the new energy authority should be extended; its responsibilities include not only protecting the interests of existing power users and investors, but the future generation as well.

###### *4.1.2. Partnership with the Utilities*

A stronger partnership can strengthen the consensual capacity for success in environmental management. Through co-operative arrangement it can allow the

stakeholders to communicate and work together to tackle an environmental problem [44]. Measures of this kind can help reduce the negative impacts associated with the confrontational approach.

The government should consider a more extensive use of Voluntary Environmental Agreements (VEAs) in collaboration with the power companies. VEAs offer greater flexibility on environmental issues for companies. However, the government traditionally did not proactively promote its use with the private sector [45]. It is suggested to design a co-operative management model for the power industry, which aims to make the mutual dependencies productive; it should make use of the problem-solving capacity of the companies by forging strategic alliances with them [44]. The DSM Programme implemented by the two local power companies during 2000–2003 fell into this category, although it was not appreciated by the power companies. There is a case for the government to show the power companies the benefits of forming partnership, and perhaps to relax as appropriate the incentive structure stipulated in the regulatory framework to allow realization of benefits.

Meanwhile, the government has to act as a mediator between the power companies and other social actors to facilitate communication and dialogue so as to avoid the possible public backlash against such ‘collusion’. Financial supports to collaborative projects between the power companies and green groups, universities and community groups are important to lessen the costs involved in developing innovations. These include direct subsidies or low interest loan, which serve to make investment in VEAs no longer a burden to the industry which is often a major barrier to its adoption [45]. In any case, the benefits must be made more explicit, as a lesson learnt from failure of the DSM Programme which was attributable to the abandon of attractive incentive earnings as rewards or compensations to the power companies.

## **4.2. Redesigning the Regulatory Structure**

### *4.2.1. Strategies to Prepare for Future Competition Option*

The conclusion that full market liberalization is not appropriate at the moment should not be considered as one of advocating a continuation of the status quo without any change at all. There are less risky options for the time being when the socio-political conditions required for the full opening are not yet fulfilled. For long-term planning, the present closed, monopolistic regulatory model must move to a more contestable market structure step-by-step.

Enhancing the HEC-CLP interconnection capacity is a necessary precondition for the introduction of generation-level competition. This could create some degree of pressure for the companies to invest in customized environmental innovations, while lessening intense competition which encourages cost-cutting strategies that result in negative environmental consequences and supply reliability problems. The consultancy report by Environmental Resource Management [19] noted that the interconnection is technically feasible, though it may bring about asymmetric distribution of economic benefits between HEC and CLP. Chan [16] suggests that there are some minor structural changes can be made to reduce the hurdles to the introduction of competition in future. For example, the electricity industry could be

unbundled such that generation is separated from the transmission and distribution functions as different legal or account entities without affecting the ownership structure. It will allow wider choices of supply options by a small number of large customers, and will not substantially affect the vertically integrated nature of the existing monopolies while making the industry structure ready for competition.

#### *4.2.2. Cost Recovery Mechanisms*

For any environmental initiative the possibility of recovering the costs incurred is always the primary concerns of the power companies. In a competitive market there would be no case for subsidizing at the expense of supply resources. Cost recovery mechanisms have to be established to help reduce the commercial risks and costs of the environmental facilities to motivate the private power companies.

The government should consider implementing green pricing programs. It requires a special fee or charge directly associated with the consumption of electricity to finance the investment in green technologies. Customers would be allowed to choose among different options, including renewable power, beyond the traditional supply mix. Public interest funds can be set up for this purpose. It is collected through monthly electricity bills and designed to support energy efficiency programmes or development of renewable energy. More importantly, it must be non-bypassable and mandated by the government to avoid the problems of free-riding in the case of voluntary commitment [46]. In addition, it is expected that the public support would be adequately strong only in medium-to-long term. At that time, more extensive tariff systems could be developed to offer different tariffs for different sources of energy, including renewables. Customers will then be offered a range of tariffs and those who are strongly guided by environmental principles can freely choose a greener option by paying a premium (i.e. electricity generated from wind, hydro power, landfill gas, etc). A role for the government may be to establish a certification system to ensure the validity of renewable electricity supply. It is because consumers usually do not trust the new products of established energy suppliers and so confidence-building measures are needed to enhance market penetration. In fact, a green tariff scheme has been recommended by the consultancy report on the feasibility of renewable energy in Hong Kong [28].

#### *4.2.3. Performance-Based Regulation*

No doubt that the current rate-of-return regulation under the SCAs is not consistent to the changing environmental context. It is therefore suggested to be replaced by performance-based regulation (PB regulation) [16, 47]. PB regulation links the utilities' profits to its performance, including financial and environmental. It can be designed in many ways such as price cap, yardstick/benchmarking and earnings sharing, in the form of targeted PB regulation or broad-based PB regulation [47]. Compared to the rate-of-return regulation, the key advantage of PB regulation is that there are higher incentives for the utilities to improve their performance more efficiently rather than relying on 'command-and-control' measures. Although regulatory costs may increase, it is considered as a better mechanism to align the interests of utilities, consumers and, if properly designed, the environment as well.

### **4.3. Building Demand-Side Capacity**

#### *4.3.1. Demand Response Initiatives*

Consumer participation in balancing of supply and demand is essential to make competitive electricity market more efficient [48]. It can be made possible by allowing consumers to respond to a set of supply-side strategies which would affect the producers' decisions on resource planning while producing mutual benefits. Typically it involves load shifting in demand side in response to price signals and a widely adopted strategy is the use of real-time retail pricing such as time-of-use pricing scheme. Flexible, discriminative pricing scheme allows utility managers to manage demand more effectively and also offers greater financial incentives to consumers to change the time at which electricity is used. A higher price for electricity consumption at peak hours can level off the demand which ultimately reduces the need to expand the generation capacity. So, the merits of price discrimination include not only reduction in power consumption but also lower tariffs in less busy timeslots which can reduce the burden to lower class if properly managed. A successful discriminative tariff structure is conducive to achieving both economic and environmental goals while avoiding the potential disastrous effects of more competition.

There are a few initiatives to encourage the power companies of Hong Kong to extend the time-of-use pricing strategies. First, retail price regulation should be reviewed to ensure that it does not impede demand response. Price discrimination can alter electricity demand in a way that minimizes capacity expansion while meeting the demand. Tightening the control over electricity prices may, however, limit the emergence of innovation in retail pricing. Second, the utilities' profits have to be decoupled from the electricity sales by replacing the current rate-of-return regulation with, for example, PB regulation, so that load reduction would make more economic sense for the utilities. Also, a time-of-use metering system is necessary to provide information on the time-varying electricity prices for consumers to rearrange the consumption. Governmental subsidies for installing advanced metering equipment may be needed, given that the relatively high cost involved [43].

#### *4.3.2. Localized Institutions for Negotiation*

Institutions for negotiation between diverse interests have to be set up. By diverse interests it includes the ratepayers, environmental organizations and investors, on the basis of a multi-stakeholder approach. The community should be encouraged to form stronger informal linkage with the utilities. It has to be localized to avoid free-riding behaviours. Building up social capital through localizing governance and participation would be one of the possible ways out to encourage individuals' commitment. Local institutions, rather than regional, such as individual housing associations and the District Councils, could be the potential partners for organizing energy-related environmental programs, especially energy saving activities. Broader representation can also help empowerment of the local people. Education campaigns have been a common form of the collaboration, but it is meaningful only when accompanied by other initiatives requiring real commitment, such as the DSM Programme which consisted of both demand management mechanisms and awareness-raising activities. For capacity building, the public or the consumers' dependence on government has to be lessened while the interdependency with the utilities via VEAs has to be strengthened.

## 5. CONCLUSION

The growth-oriented development paths of Hong Kong have made it difficult to fully replicate the Western models. The firmly entrenched non-interventionism extended from its economic model has rendered the electricity regulatory framework low degree of flexibility, and the real preferences of the citizens also hint potential negative consequences of a big movement. Immediately opening the door to more power suppliers is more likely justified by economic reasons than environmental ones since the latter are vulnerable in competitive market. Building such a market in Hong Kong will probably leave no room to this social agenda if the barriers are not well-understood and overcome. International experiences suggest that freer market *per se* is far from a perfect solution. Arguably a well-functioning power market for sustainability depends on the presence of properly designed policy intervention to prevent it from being dominated by short-term behaviors.

In principle, a competitive business environment can stimulate environmental innovations. Nevertheless, a competitive market is only capable of creating the spaces for sustainability but not sustainability itself. It means that although competition can provide favourable condition for stronger provider-consumer interaction, its success is largely determined by public support in the form of market demand. Competitive green market model holds only when environmental issue is a dominant concern in the society, or it will become a standard market that merely serves development objectives. Market opening that can make renewable energy available will not be economically viable unless somebody is preparing to pay for it. For Hong Kong, mild changes to the policy framework and practices would pave the way towards a more competitive green power market, and the key to which is a concurrent transformation of the roles of the government, power users and producers as well.

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