

Consumer Council

Submission on "Public consultation on the future development of the electricity market in Hong Kong"

Introduction

1. The Consumer Council (the Council) is pleased to submit its response to the Environment Bureau's document "Public consultation on the future development of the electricity market in Hong Kong" issued on 31 March 2015. The Council has produced a detailed report¹ on the electricity market in December 2014. The December report is also part of the Council's response to this Government consultation and needs to be considered alongside this document.
2. The December report called for a broader consideration of the issues beyond the single question posed by Government in its fuel-mix consultation. The Council welcomes and supports the publication of the consultation document. However, it is concerned that the consultation's conservative approach may not bring meaningful and significant changes to the long term development of the electricity market in Hong Kong. Hong Kong must be determined and clear about introducing the necessary changes, or will otherwise risk waiting for another 10 years till the next major discussion.

Council's responses to each question

3. The Council hereby responds to each of the questions in the consultation document.

Q1. HOW IMPORTANT IS CHOICE TO YOU IN RESPECT OF THE SUPPLY OF ELECTRICITY? WHAT OBJECTIVES DO YOU CONSIDER SHOULD BE ACHIEVED THROUGH INTRODUCING COMPETITION TO THE ELECTRICITY MARKET?

4. The Council believes that competition should be introduced into the generation market. However, the Council does not support the introduction of "spot" electricity markets which can deter smaller generators. The evidence does not support the introduction of competition at the retail level.

Generation competition

5. The Council believes the objectives of introducing generation competition is to reduce the wholesale price of electricity, improve Hong's Kong's economic efficiency through releasing business resources currently being spent on purchasing

¹ Consumer Council (December 2014) Searching for New Directions - A Study of Hong Kong Electricity Market

power into productive use, create a more innovative generation sector that embraces technologies like renewables and distributed generation and cogeneration, and help mitigate commercial, technological and fuel costs risks by diversifying the participants in, and the approaches taken to, electricity generation.

6. Hong Kong has high generation margins paid for by customers. A competitive generation market would allow the demand-side and electricity storage to play a role in reducing peak electricity demand, that is responsive demand side management, allowing customers to shift their demand away from peak time thereby reducing the need for little-used, expensive and polluting generation assets that are idle for most of the time.
7. Contestability will allow the entry of different actors into generation, different ways of thinking and modern technologies. Electricity generation is not a natural monopoly: competing firms can and do sell electricity through the 'monopoly networks' in most other jurisdictions. Generation competition opens up the market to new companies and new ideas, such as natural gas-fuelled distributed energy, renewables, or in the longer term clean power from the Mainland.
8. The Council does not support the introduction of the "spot" or "forward" electricity markets that are found in other countries. These are used by market participants to hedge long-term price risks, and to set high or even punitive penalties for non-delivery. The complexity of the rules governing these markets, and their capture by larger firms that are able to game the system, deters renewable generation and co-generation plant that cannot afford to participate and which cannot always operate with the sort of flexibility to respond to such price signals. The introduction of such markets will increase the cost of the system and it is far from clear that the benefits will compensate. Decisions about scheduling of different plants can instead be determined by the system order using clearly set out principles for assigning the merit order.
9. To achieve generation competition, the Government needs to establish a proper mechanism to ensure new entrants compete on a level playing field with the incumbents. The Government has itself reviewed the evidence and noted several examples of such generation competition. In the consultation document it concludes of UK²: "...the increase in competition was believed to have increased operational efficiency and helped drive down tariff", of Australia "tariffs dropped in the 1990's as a result of efficiency gains from market reforms and privatization", and of Singapore "competition at the generation level has brought about a change in the use of cheaper fuel type and helped exert downward pressure on wholesale electricity prices". One opportunity from generation competition that saves money and reduces greenhouse gas emissions is co-generation. Waste heat from power production can be recovered and used locally to produce cool water through

² Though the Council believes the reasons for the decline in electricity prices were in truth more complicated and not primarily about competition. Annex B of our December report sets out the reasons.

absorption chillers. Such tri-generation can be seen at small scale in the Zero Carbon Building in Kowloon Bay.

10. The idea of using tri-generation complements the existing plans to roll-out district cooling in new developments and self-contained sites like universities and hospitals. These locations would use natural gas or renewable combustion fuels like waste, landfill gas or sewage gas to generate heat and electricity, the heat would be converted to cool water. Customers would connect to the district cooling system. The development plans already require for district cooling using sea water to cool the water, the use of tri-generation in place of sea water is a minor improvement. It could be rolled out to hospitals and new developments like Kai Tak through district cooling networks. With trigeneration instead of just 50% of the energy content of the gas being productively utilized, as is the case with Combined Cycle Gas Turbine (CCGT), about 70%-80% of the energy can be recovered in a well-executed system.
11. The Council believes such generation competition could work alongside the Scheme of Control Agreements (SCA). These new generators would enter into Power Purchase Agreement (PPA) with the two electricity companies where payment is on delivery of measured outputs (e.g. kWh of electricity), or feed-in tariffs for renewable electricity rather than a permitted RoR on capital. The money to pay for the activities could be taken from customers' electricity bill and appear as operating expenditure. (This is already how the payments from CLP to Daya Bay nuclear plant are treated within the SCA. This is already in essence a PPA with a Mainland generator through an interconnector.)
12. Because of the current state of excess capacity in Hong Kong's generation there is time to plan the incorporation of these new generation sources. In the Consultation document and in recent announcements by the electricity companies, there appears to be a desire to rapidly build new gas CCGT in time for 2020. The Council cautions against the commitment to build so large an amount of new gas – substantially increasing the current installed capacity – so soon, since this would lock Hong Kong into gas, a relatively high carbon fuel, compared to the scale of carbon emissions reductions required globally, for another 25 years. The alternative, gas fired co-generation on new developments, can be added in smaller increments if efforts to reduce peak demand through responsive DSM and renewables are insufficient.
13. The Council believes competition in generation on a level playing field can be introduced, by the following steps:
 - i) excluding all future generation assets built by the two power companies from the Average Net Fixed Assets (ANFA),
 - ii) posting access terms for use of the transmission and distribution networks so that investors in large generation & interconnectors have a clear understanding of the commercial environment in which they need to plan and secure finances for their investment decisions,

- iii) establishing an independent system operator to ensure all generation and interconnected plant is scheduled to maximize efficiency to an agreed merit order, and
- iv) paying new generation plant either feed-in tariffs (if renewable energy) or on terms agreed in power purchase agreements if the power originates from interconnection with the mainland or gas-fired distributed co-generation of power / heat and cool.

Retail competition

14. The Council does not support the introduction of retail competition for consumers. There is no reason for retail competition to flow from generation competition. The two are quite separable. The views expressed in the Government's Consultation document concur with the Council's findings as summarized in its December report. While the introduction of retail competition clearly increases costs, the benefits are much less clear. The introduction of retail competition requires the electricity companies to develop IT systems to switch customers, recruit a sales-force to expand market share (opening up the possibility of dubious sales practices to sell an undifferentiated commodity product), and increase the volumes of phone traffic to handle queries on switching and complaints arising from switching. The Council's December reports evidence of deliberate miss-selling and consumers accidentally making the 'wrong' choice for them and end up with a higher bills after switching to inappropriate tariffs³.
15. Retail competition also works to the disadvantage of more vulnerable / sticky customers who typically face increased prices. It also makes the roll out of some forms of energy efficiency - such as applying insulation to the entire façade of a building or replacing the electrical air conditioning system with a chilled water system – even more difficult to co-ordinate.
16. Consumers *do express a desire to exercise some* choices about their electricity. For instance, some customers might prefer a cheaper interruptible or time-of-use tariffs, others may wish to pay a premium for green electricity. The Council believes the electricity companies should be free to offer these options to customers under the SCA.
17. In the UK the largest electricity supplier, British Gas, has a variety of different tariffs to accommodate different consumer preferences. There are broadly four sorts of tariffs: **Standard tariffs** – here the level tend to be reviewed every six months, **Sustainable energy tariffs** – the company promises to buy electricity from renewable generators equal to that used by the customer, **Fixed price tariffs** - various locked-in tariffs so customers can mitigate volatility in their electricity bills, **Smart meter tariffs** – available to customers with smart meters are currently being trialled⁴. There are several different tariffs including “free Saturday or Sunday”

³ Consumer Council, *op cit* para 2.30

⁴ UCL energy Institute (March 2015), Michael J Fell, Moira Nicolson, Gesche M Huebner and David

which provides free electricity on Sunday to encourage non-time critical but power hungry activities like laundry, grass-cutting, drying to be undertaken on off-peak day. There are also time-of-use tariffs that use discounts to encourage people to delay non-time critical electricity usage to off peak times.

18. The well respected publicly owned Californian electricity utility Sacramento Municipal Utility District (SMUD) has installed smart meters in the homes of all 600,000 domestic customers. It has recently piloted a Smart Pricing Option (SPO) tariff⁵ with a critical peak tariff around ten times higher than the standard tariff to flatten the day time peak caused by air conditioning. Customers using this tariff cut their consumption during these critical times by 25%. If this is extended to other customers it could greatly reduce the need for peaking plant (13% of SMUD's installed capacity is only used for 40 hours a year).
19. SMUD customers are offered several different options including green energy, solar billing (which allows payments from own-generated solar to offset bought-in electricity), loans for installing energy efficiency, summer/winter off-peak and super-off peak tariffs, carbon offset (and extra \$10 per month to fund tree planting), and advise for customers using plug-in hybrid cars.

Q2. TO WHAT EXTENT DO YOU THINK THE CURRENT CONTRACTUAL ARRANGEMENT BY SCA'S HAS ALLOWED US TO ACHIEVE THE ENERGY POLICY OBJECTIVES OF SAFETY, RELIABILITY, AFFORDABILITY AND ENVIRONMENTAL PROTECTION, AND WHAT PROBLEMS DO YOU SEE WITH THIS REGULATORY APPROACH?

20. In the past decades the SCA has delivered a reliable and safe electricity system. It has been successful at incentivizing investment to improve air quality since this requires investment to scrub pollutants from the flue at existing sites. Such 'end-of-pipe' environmental investment and investment to enhance safety and reliability within the transmission and distribution grids can readily be added to the ANFA and accommodated into the permitted rate of return style of price setting. It has also been successful at encouraging investment in distribution to allow new towns to have reliable and safe electricity. This is an example of the companies performing its natural monopoly function in a regulated environment.
21. There are a number of deficiencies in the SCA that should be remedied. The Council sets out some of them in the December report. However, there is a tension with the SCA form of regulation and the objectives of affordability. Certain forms of environmental protection do not lend themselves to end-of-pipe investments. In particular the goal of improving the economy's carbon intensity requires investment in household energy efficiency and the development of generation or

Shipworth, "Is it time? Consumers and time of use tariffs"

5 Interestingly SMUD experimented with two groups of customers on the SPO tariff some who were recruited via opt-in, others recruited via opt-out.

co-generation in new sites that are not currently owned or operated by the two electricity companies. The Council does not believe such investments need or should be made by adding to the ANFA, but through a parallel arrangement in much the same way as the power purchased from Daya Bay is accommodated within the SCA.

22. If new gas plant is funded through the current ANFA system this would mean that the customer would have to pay a charge on the electricity bill over the life time of the plant which is currently 25 years. Given the trajectory of reducing greenhouse gas emissions being agreed globally there is a real risk of locking consumers into paying for technologies that may become incompatible with emerging climate change priorities. This is a matter of some concern for the Council.
23. The current SCA system leaves the customer to pay for volatility in fossil fuel prices and other changes in the business's other operating costs. The customer also has to pay the costs for the substantial generation margins through the ANFA. The companies continue to forecast growth in demand, especially in the New Territories, justifying further capital spending on generation and new network. In theory, there is a mechanism for sharing the risk of optimism bias between customer and business but in practice all new costs have been added to the ANFA and the customer has shouldered the cost of incorrect forecasts. Other systems of regulation transfer some or all of these risks to shareholders. Within the SCA not only are the risks retained by the consumer, the shareholders also obtain a very high return on equity corresponding with substantial business risks – which is far from the low-risk situation for the Hong Kong electricity sector.
24. The SCA is not as transparent as the Council believes it should be. As set out later in the Council's response there is a range of forward looking cost and demand forecast items that the Council believes should be disclosed so that stakeholders can assess future investments in generation technology and grid enhancement that are necessary and represent good value for money. This is particularly pertinent at the moment because of the proposed new investments in gas fired generation and Advanced Metering Infrastructure (AMI) which if agreed would require substantial new additions to the ANFA adding to consumer bills for many decades to come.
25. The SCA has also been ineffective at bringing forward more innovative capital expenditures. Innovation relies on deployment of capital items that do not have easily referenced costs. Only firms that are actively engaged in researching and deploying these technologies are able to determine the necessary level of capital spending. Government does not have the expertise or access to information to make an up to date or forward looking assessment of whether sought-after spending is reasonable. Both companies have made proposals for off-shore wind in earlier development plans. These investments were not approved – the Council would argue, not because the technologies are intrinsically bad, or inappropriate for Hong Kong but because the SCA is a poor mechanism for Government to assure itself that consumers are being asked to pay the correct price. This issue will arise

again and again as Hong Kong seeks to deploy new technologies like AMI, smart meters and renewable technologies.

26. A further problem with the SCA is that the electricity companies are only able to increase profits by increasing the book value of ANFA, being awarded a higher RoR or at the margin achieving their Penalty-Reward targets. This is poorly aligned to the public interest in cutting operational spending, shifting or reducing demand and extending the life of existing assets. At the moment the Government is required to step in and scrutinize detailed and highly technical information to judge whether spending plans are fair.
27. In the Council's detailed report of December 2014, a "Gradual and progressive reform" is proposed in Suggestion 1. By this the Council means electricity market requires long-term planning and investment, and progressive change should be introduced to gradually transform the monopolistic and non-transparent market to a sustainable and competitive market that could bring real benefits to consumers.

Q3. WHAT IS YOUR VIEW ON THE FOLLOWING AREAS IN THE CONTRACTUAL ARRANGEMENT (IF ANY) BETWEEN THE GOVERNMENT AND THE POWER COMPANIES -

Duration

28. If Government decides to continue the SCA model the current duration of ten years for the SCA would seem to be a balanced timeframe. This provides a balance between the interests of investors making long term investment decisions and the need for periodic review and improvements to the regime. However there is virtue in reviewing aspects of the agreement every five years at the same time as the Development Plan. With hindsight, the permitted Rate of Return (RoR) of 9.99% now seems high given the fall in global interest rates since the financial crisis. If necessary, the Government should reserve the right to review the RoR every five years. This would allow the rate to better reflect the ongoing costs of investing and refinancing capital projects. This would allow less sharp changes in the RoR than would occur if the RoR is only reviewed every ten years.
29. Later in this document the Council will argue for new instruments to incentivise the operating performance, renewables and energy efficiency. Though the mechanism itself should be stable over time it is highly desirable that the levels at which support is paid should be reviewed more frequently to allow the payment to reflect up to date renewable technology costs, or the saturation of particular energy efficiency opportunities. These could be included as a parameter in a schedule to SCA agreements without changing the overall architecture of the agreement.

Permitted RoR

30. The rate of return should provide a balance between a low but reasonable electricity tariff for consumers and a fair return to investors commensurate with the

cost of capital of a well-run company and the risk that the investor faces.

31. The Council would like to see the permitted ROR reduced to around 5.25% to 6%. There have been some significant and sustained changes to the capital markets since 2005 when the RoR was last reset. Global interest rates are much lower as a result of central banks in USA and Europe's quantitative easing programmes.
32. US treasury bonds are taken to proxy risk free return. As shown in Figure 1, the historical US 10-year Treasury Bond (the same duration as the current SCA) rates show a downward trend from about 6.5% in 2000 to the present 2.25%. As the risk-free return has fallen drastically in the last 15 years, the 9.99% RoR permitted on the basis of investment environment in the last review warrants substantial downward adjustment too.

Figure 1: Decline in yields on 10-year US Treasury bonds between 2000 and 2015

Historical Treasury Rates



Source: US Treasury website
<http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/Historic-LongTerm-Rate-Data-Visualization.aspx>

33. It should be noted that the cost of capital had been declining even before the recession of 2007. For instance in the 2004 Periodic Review the UK water regulator looking forward to the period 2005-10 set the weighted average cost of capital at 6%⁶ plus inflation.
34. Both companies have excellent credit ratings so the cost of debt finance of CLP Power Hong Kong and Hong Kong Electric Company (HKE) is only somewhat higher

⁶ See The Water Services Regulation Authority (OfWat 2004) "Future water and sewerage charges 2005-10 Final determinations - Periodic review 2004", graph and description on page 139

than the cost faced by the US Government: HKE currently pays between 1.65% and 4.55% for medium term notes⁷, CLP recently secured 10 year loans at 3.125%⁸. Both companies make extensive use of relatively low cost debt finance. In 2014, HKE undertook a near simultaneous refinancing and IPO, replacing a substantial portion of the value of the ANFA with debt. There is now a large divergence between the HKE's ANFA and its capitalization of the company reflecting the net present value of the windfall profits being earned from the gap between the permitted RoR and the cost of debt. The net debt-equity ratio is 65.7% for CLP and 87.9% for HKE at the end-2014⁹. This high gearing means that the ANFA is largely financed by low-cost debt, not shareholder equity. Effectively, it can be estimated that the power companies' returns to equity could be over 23%.

35. A recent report by World Economic Forum (in collaboration with Bain & Company)¹⁰ states that the weighted average cost of capital (WACC) for European utilities is 7-8% and is 4-8% for US utilities.
36. The table below gives the allowed returns in UK where businesses associated with HKE's parent companies also have infrastructure businesses. In the UK recent price determinations for regulated utilities water and electricity have been between 4.24% and 5.1% plus inflation (RPI). The RPI in UK has been around 1.1%.

Table 1: UK regulated utilities and return profile

	UK Northumbrian Water	UK Power Networks	Northern Gas Networks	Wales & West Utilities
Type	Water & Waste	Power distribution	Gas distribution	Gas distribution
Allowed return	Real allowed return of 5.1%	Real allowed return of 4.7%	Real allowed return of 4.24%	Real allowed return of 4.24%
Regulated asset base	Nominal adjusted by inflation	Nominal adjusted by inflation	Nominal adjusted by inflation	Nominal adjusted by inflation
Inflation mechanism	RPI	RPI	RPI	RPI
Risk	Low inflation	Low inflation	Low inflation	Low inflation
Ownership	CKI (40%)	CKI (40%), PAH (40%)	CKI (47%), PAH (41%)	CKI (30%), PAH (30%)

Source: Credit Suisse (*Op cit*)

37. The Australian Energy Regulator (AER) has recently made a final decision for ActewAGL, the distribution network operator in the Australian Capital Territory that sets the allowed rate of return (or cost of capital) for ActewAGL at 6.38% for 2015-2016. Cost of low risk debt in Australia is low. The current Australia Government 10-year Bond Yield is 2.85%, according to Bloomberg.
38. The Council believes that consumers and not just shareholders should benefit from

⁷ HK Electric Investments 2014 Annual Results, Chairman's Statement, p 26.

⁸ CLP Media Release (28 April 2015) "Issue of US\$300,000,000 3.125% Notes due 2025 by CLP Power Hong Kong Financing Limited".

⁹ Credit Suisse (02 March 2015) *Hong Kong Utilities Sector*, p 27, 31.

¹⁰ World Economic Forum (in collaboration with Bain & Company) (Jan 2015) "The Future of Electricity Attracting investment to build tomorrow's electricity sector"

the low debt costs, and the Government should negotiate vigorously with the power companies for a much more balanced RoR on behalf of the public. It is common in other jurisdictions for the permitted RoR to be calculated by the regulator using three components – a prudent capital structure (though regulated companies are not obliged to use this and are free to set their own structure), the cost of debt, and the allowed Return on Equity (ROE). The Council advocates Government establishing a similar transparent approach in determining the RoR for electricity companies. The Council considers a RoR today any higher than 5.25% or 6%¹¹ would be unfair to consumers as they bear the key risks and costs: fuel price, demand forecast error made by power companies, overcapacity in generation, network capacity and distribution inefficiency, through the system of fuel cost and annual tariff adjustment.

39. The Council notes that in other jurisdictions power companies can earn additional return through attainment of public policy targets. In the UK, Ofgem introduced the “Revenue using Incentives to deliver Innovation and Outputs (RIIO)” framework¹². This is similar to the SCA’s current incentives and penalty system the main difference being one of scale. The Council believes it would be appropriate to allow enhancements to the RoR beyond 5.25% - 6% for attaining targets like successfully connecting RE and distributed cogeneration using gas. This would align incentives on the companies with the public policy objectives of opening up competition and increasing the successful connection of RE/co-generation. The SCA might also enhance RoR if the electricity companies deliver time-of-use tariffs and systems which can shed load and reduce the demand for peak electricity. The Council does not recommend that the electricity companies have responsibility for delivering energy efficiency targets so it would not be appropriate to include these within the scope of enhanced incentives & penalties regime.

Tariff approval mechanism;

40. The Council agrees that proposed annual changes in tariff need approval by Government every year and also reviewed by LegCo if the rise is above 5%. At the moment it is difficult for outside stakeholders to participate in the debate when only the backward looking data is visible. For the 2014 Tariff review, budgets of forthcoming projects, fuel prices and forecasts volumes were all withheld from the published documents. The Council is concerned that so much important information is being withheld from stakeholders under the guise of commercial confidentiality. The Council would like this to be reviewed and the excuse of commercial confidentiality to be used under stringent scrutiny. The Council’s views

¹¹ The Council’s baseline RoR is estimated, by using a typical 50%-50% debt and equity financing structure, a reasonable bench mark interest rate of 3.5%-4% for a 10 year bank loan by a comparably sized electricity company with a relatively stable stream of income. Currently the average market risk premium for equity is in the range of 7%-8%. We assume “safe” regulated electricity companies have half of this market risk, so the required equity return is calculated by 10 year loan rate + 0.5 x risk premium, giving a return to equity of 7% - 8%. With a 50% : 50% debt / equity structure this implies an RoR of 5.25%-6%).

¹² Office of Gas and Electricity Markets (4 October 2010) Handbook for implementing the RIIO model

on better transparency will be described later.

Fuel cost arrangement:

41. The Council also supports the approach being outlined in the consultation document. Any approach other than simply passing through the international cost of fuels would result in a risk premium being charged to consumers. It is worth noting that this provision substantially reduces the business risk and so a reasonable *pro quid quo* is that the companies should accept a lower RoR.

Incentive and penalty scheme relating to the performance of the electricity companies?

42. The issues of supply reliability, operational efficiency and customer services are important to consumers and the companies are to be complemented for achieving each of their targets and obtaining the maximum benefit of 0.03% ANFA. Rather than continue to provide an on-going reward to companies now that the processes are ingrained in the company's cultures, the Council recommends retaining the penalty for any slippage in performance, but withdrawing the benefit for achieving the target. The Council agrees that the HKE SCA should be brought into line with CLP's with regards to the emissions target. The Council believes that energy efficiency saving and energy efficiency audit and the renewable energy performance should be reviewed and replaced by a new mechanism. This is discussed in the Council's response to Question 5.
43. The Council would also like to see electricity companies achieve an affordability target so that *vulnerable* Hong Kong households should not spend an unacceptable amount of money on maintaining their homes at a safe temperature. In other countries consumers that need to spend 10% or more of their incomes on domestic energy are classed as fuel poor. Domestic energy costs are typically lower in Hong Kong than other wealthy regions like Europe and North America, but accommodation costs are higher, and income inequality is more extreme so the definition of fuel poverty would need to be reviewed to reflect the local circumstances.
44. Government needs to play its part by commissioning a household survey to assess the extent to which fuel affordability is a problem especially in sub-divided flats. This would require primary research to determine how many families live in overcrowded conditions so have high electricity consumption and high cooling needs, what proportion of these households have vulnerable people: babies, very old or physically challenged people, or people with special medical needs and what electricity tariffs (tiers) they presently pay. Electricity companies need to play their part by offering tiered tariffs appropriate for large and crowded houses. In many jurisdictions there are special tariffs available for vulnerable people. For instance in California, the investor owned utility PG&E provides special CARE tariffs for low income households¹³. The regulator CPUC advises the investor owned companies about which groups of people are eligible for discounts and this is based on

¹³ See the CARE Program of Pacific Gas & Electric Company, UK.

household size (the threshold is US\$31,860 for a 1-2 person household) and there are special provisions for people living in sub-metered homes that suffer from California's tiered tariffs. The discount is roughly a third off the energy charge. In the UK a similar scheme has been created called the Warm Home Discount which is available to elderly people on certain classes of means tested benefits. Eligible people are given a discount of £140 / year.

45. Organizations responsible for delivering energy efficiency (discussed later) need to play a part by ensuring their efforts are targeted at those most in need.

Q4. SHOULD HONG KONG FURTHER PROMOTE RENEWABLE ENERGY DESPITE ITS HIGHER TARIFF IMPLICATIONS; AND IF SO, ABOUT HOW MUCH (IN TERMS OF PERCENTAGE OF YOUR ELECTRICITY BILL) ARE YOU PREPARED TO PAY?

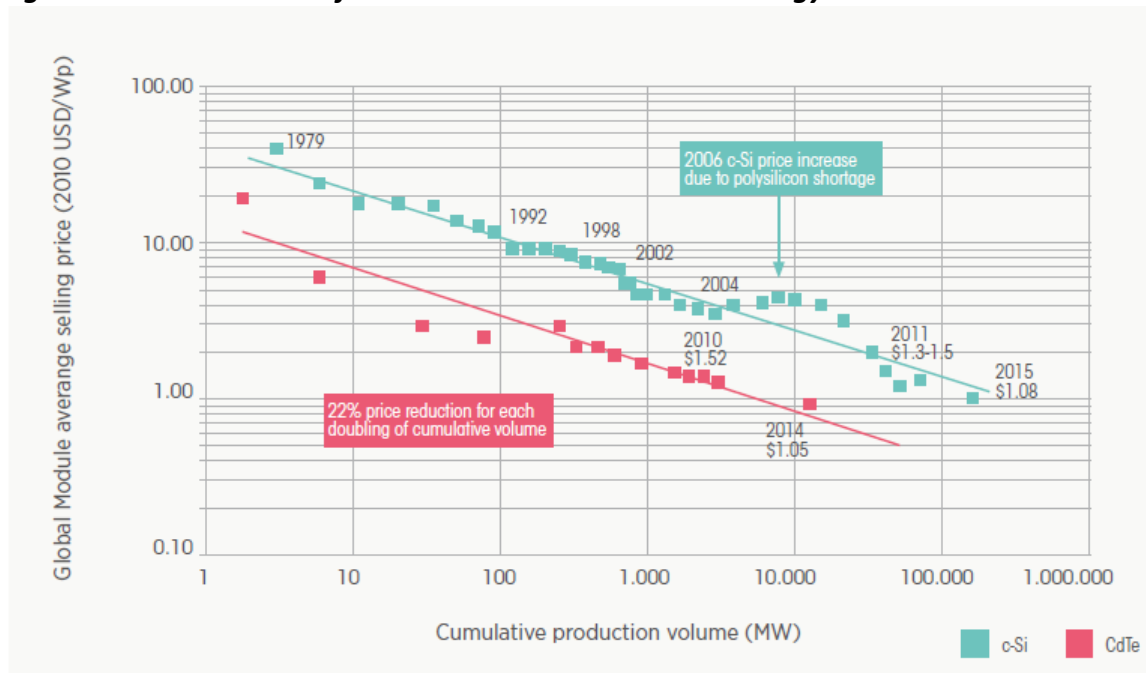
46. The Council is not convinced solar PV has higher tariff implications compared to the alternative of substantially more gas fired power. As Hong Kong starts replacing cheap coal with expensive gas, and electricity companies construct new CCGT plant the price of electricity in Hong Kong is likely to rise to a similar level to that in other advanced countries. In the most recent tariff review, CLP announced prices were scheduled to rise by 40% between 2013 and 2018¹⁴ because of the high costs of the new gas sources as older cheaper sources (Yacheng 13-1) are depleted. This tariff review did not take into account further price rises down the road arising from the construction of new CCGT plant. These will add tens of billions to the ANFA putting further upward pressure on tariffs¹⁵.
47. Technologies to combust waste, landfill gas and sewage gas are already mature and widely used in many other countries. Technologies to anaerobically digest food waste to make gas have also been deployed in other countries. The Government says in its consultation document that it plans to use wastes for energy generation which the Council endorses if a suitable site can be located.
48. There is considerable evidence that the costs of renewables (solar PV especially and on-shore wind) have fallen greatly dramatically over the recent past and are either close to or already at grid parity. The Figure 2¹⁶ shows a three-fold reduction in the price of PV modules since 2005. Such modules make up a high proportion of the total cost of solar PV – especially of utility-scale solar farms and in building integrated PV systems.

¹⁴ Provision of information by CLP on 2014 Tariff Review for the Legislative Council Panel on Economic Development

¹⁵ The 2.5GW CCGT plant at Black Point was reputed to have cost CLP HK\$24 billion in 2004. The HK construction price index has increased by 50% since then implying a cost of around HK\$36 billion, which is around a third of CLP's ANFA <http://www.power-technology.com/projects/blackpoint/>

¹⁶ International Renewable Energy Agency (IRENA 2012) "Renewable Energy Technologies: Cost Analysis Series - Solar Photovoltaics"

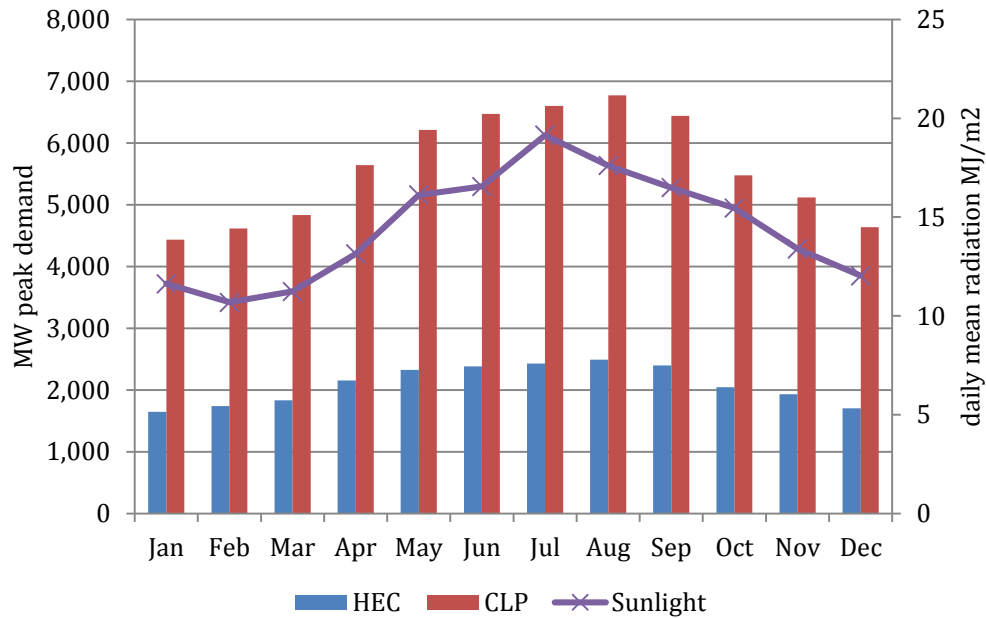
Figure 2: Decline in cost of solar PV modules as the technology matures



49. As a result, there has been a sharp fall in the support costs for solar in many territories. In a recent UK auction for feed-in tariffs¹⁷ large-scale solar farms bid for a wholesale guaranteed price of between HK\$580/MWh and HK\$920/MWh. Hong Kong has around 30% more sunlight than UK. Substantial amounts of off-shore wind bid at around HK\$1320/MWh and on-shore wind at HK\$920/MWh. (By way of comparison the wholesale price of gas fired electricity (CCGT) in UK is around HK\$520/MWh.)
50. It is worth emphasizing that the value of solar PV in Hong Kong is more than the wholesale price of electricity. In Hong Kong solar PV's peak output is exactly when demand is highest – summer afternoons. Thus solar PV tends to displace expensive oil and coal fired peaking plant reducing the territory's need to maintain this expensive and polluting electricity source. Figure 3 shows the amount of insolation is juxtaposed on CLP / HKE's load curves. The match is almost perfect. Instead of being valueless, well-integrated solar PV in Hong Kong could be highly valuable.

¹⁷ Department of Energy & Climate Change (26 February 2015) "UK Official statistics - Contracts for Difference (CFD) Allocation Round One Outcome"

Figure 3: Monthly demand for electricity for HKE and CLP and daily mean irradiance in Hong Kong



51. The Council considers the consultation too pessimistic about the quantity of renewables that might be generated locally. The Council recommends that Government reviews the potential for renewable technologies bearing in mind the sorts of sites that have been exploited for solar in other countries. It is often quite hard to anticipate beforehand relying on the ingenuity and enthusiasm of entrepreneurs in the community of people that might host distributed generation: these include car-parks, landfill sites, warehouse buildings, water treatment plants, even reservoirs¹⁸ and prisons. Different studies have been published over the years suggesting there is potential for Hong Kong to produce significant quantities of renewables either from off-shore wind in the southeast waters¹⁹ or by installing solar PV²⁰ in reservoirs. In the longer term wave and tidal sources could be important. These technologies are still at a pre-commercial level of development so

¹⁸ See PV magazine (April 2012), Charles W. Thurston, “From land to water”, and also PV magazine (November 2013), Ian Clover, “Qatar to install utility-scale reservoir rooftop solar panels”.

¹⁹ Engineering assessment of the size of offshore resource based on 10 years measured wind data. Assessment concludes 25% of Hong Kong’s annual electricity demand could be met by off shore wind. Engineering assessment of the size of offshore resource based on 10 years measured wind data. Assessment concludes that 25% of Hong Kong’s annual electricity demand could be met by off shore wind. See article by Xiaoxia Gao, Hongxing Yang, Lin Lu (13 February 2015), “Study on offshore wind power potential and wind farm optimization in Hong Kong”, and Hong Kong Offshore Wind Ltd (2006) “Hong Kong Offshore Wind Farm in Southeastern Waters Project Profile” on Environmental Impact Assessment of offshore wind.

²⁰ See ICEE 2007 conference paper “Performance Evaluation of a Large Building Integrated Photovoltaic System in Hong Kong, and Lu, Lin Vivien (2014) “Status, obstacles, and Prospects of Solar Photovoltaic Development in Hong Kong”, in which an evaluation suggests 54km² of flat roof area could meet 14% of electricity demand.

would need different mechanisms to take them out of the lab, to build demonstration models that might be tried out commercially. Universities in Hong Kong are undertaking important work on these technologies. If the Government could roll out support schemes for the demonstration of pilot models like many other countries do, the Council trusts that it would inspire and accelerate the development positively.

52. There is also the possibility in the longer term of importing low carbon electricity from the mainland as a means of reducing the carbon content of Hong Kong's electricity.
53. The Council is aware of research undertaken for WWF²¹ in which 83.1% of respondents agreed the government should start to replace fossil fuels such as coal, gas and petroleum with renewable energy for electricity generation and only 3.2% disagreed, 83.7% said the electricity grid should be opened up to more parties to develop renewable energy, while 53.3% said they would consider installing devices to generate their own electricity - if the power companies bought the excess. Interestingly a high proportion of respondents agreed that households (68.3%) and high volume users (48.4%) should pay more on their electricity bills for renewables.
54. The Council undertook some modelling about the likely cost of introducing feed-in-tariffs for solar PV or wind set at levels 40% higher than those found in Europe, Asia and US. It was found that if renewables accounted for 5% of local generation, the tariff would be increased by less than 3%, with calculations based on European feed-in-tariff levy. In the calculations, the Council reviewed the level of feed-in tariff²² standard paid for on-shore wind and solar PV in 7 different jurisdictions. The cost of the subsidy for 5% renewables was calculated and then the incremental impact of the tariff was calculated.

Q5. WHAT SPECIFIC REQUIREMENTS WOULD YOU SUGGEST TO BE SET OUT IN THE FUTURE CONTRACTUAL ARRANGEMENT (IF ANY) BETWEEN THE GOVERNMENT AND THE ELECTRICITY COMPANIES TO ENCOURAGE THE PROMOTION OF DEMAND SIDE MANAGEMENT²³ AND RENEWABLE ENERGY BY THE ELECTRICITY COMPANIES?

55. Hong Kong has established a target to reduce its greenhouse gas emissions per unit output and this requires a mixture of renewables and improved energy efficiency. A sustained improvement of energy efficiency over a long term period can have a very dramatic effect in reducing consumer electricity bills as many investments in building fabric generate savings that persist for long periods of time. The Council

²¹ The Council is grateful to WWF and University of Hong Kong for sharing the full report. Phone interview of 1030 people by Public Opinion Programme, University of Hong Kong

²² For UK the export tariff subsidy is also added. For South Korea support is through a renewable portfolio standard rather than FIT so the traded price of the renewable portfolio certificate was used

²³ In this document the Council adopts the Government's terminology and use DSM to mean energy efficiency, and use responsive DSM to mean demand shifting

believes Government should put great emphasis on improving energy efficiency in the future regime, with much more aggressive targets set for power companies and the public to follow, as the scope for reducing energy use is highly significant and can have a profound impact on reducing Hong Kong's energy use.

Actions to improve DSM within the SCA

56. The SCAs currently provides a small (0.01% of asset base) all-or-nothing incentive to electricity companies to invest in their customers' energy efficiency. The 12GWH target for energy efficiency is unambitious representing just 0.025% of HK's energy use.
57. There are also incentives for energy audits. CLP have also undertaken a behavior change programme in which consumers were shown their energy consumption compared to other customers. This is an interesting exercise and an evaluation of the effectiveness should be undertaken. If successful, it should be rolled out more widely. Behaviour change should be an important component of an energy efficiency strategy. However, the benefits from similar programmes elsewhere sometimes suffer from low persistency²⁴.
58. The Council is skeptical that the type and level of activity so far undertaken has had meaningful effect. It is appealing to believe that educating consumers about energy efficiency will result in an improvement but there is ample evidence to suggest that consumers already have a reasonable awareness of how to reduce energy use, but that this knowledge does not translate into action. This is the so-called "Value Action Gap"²⁵. In fact, electricity customers face many practical obstacles preventing them from enhancing their buildings' energy efficiency. Often tenants that pay the electricity bill do not own or have legal rights to change the ventilation and air conditioning system, or make changes to the outside fabric of the building. These rights may rest with the owner or the building's management company neither of whom are incentivized to make the necessary changes. This is the so-called "landlord-tenant" market failure. Also, tenants might only have a short term lease so see no financial benefit in making minor internal changes even if they are allowed to, since the payback period might extend to post-lease expiry.
59. Another impediment, common in homes and small and medium sized enterprises, is that the manager / owner lacks the expertise or time to research and implement energy saving projects especially if energy only accounts for a few per cent of the businesses' overall costs.

An alternative mechanism for delivering DSM

60. To bring about energy efficiency savings interventions are needed to influence

²⁴ European Environment Agency (2013) "Achieving energy efficiency through behaviour change: what does it take?" Programmes to provide customer information about their energy use compared to others initially save 5% - 20% of electricity, but there is rebound of up to 50% for a variety of reasons.

²⁵ Routledge (2010), Anja Kollmuss & Julian Agyeman, "Mind the gap: Why do people act environmentally and what are the barriers to pro environmental behavior?"

decisions about which model of appliance to buy, whether to improve a building's fabric or update the HVAC system in a building. Certain deeply ingrained behaviours also need to be changed: like not adding unnecessary amounts of water to a kettle. In other territories such as states of the USA, Canada, and European nations, electricity companies or energy efficiency utilities have intervened to influence electrical equipment purchase decisions and invested in enhancing the thermal performance of their customer's buildings. Such policy is needed in Hong Kong.

61. The Council recommends that policy is developed to reduce electricity demand by paying for the installation of power saving measures in people's homes, the installation of advanced thermostats and subsidising the early retiring of old, inefficient electrical equipment (like "G" rated air conditioning units). There should also be incentives to *shift* the demand for power in order to reduce peak demand for electricity and reduce the need to build new plant. All of these could quickly reduce customer bills, and in the longer term reduce the need to construct so many new power stations. In California, the regulator has instructed electricity companies to view energy efficiency as the resource of first choice to meet the state's energy needs. The extent to which the electricity companies embrace this notion is debatable but the sentiment is one the Council applauds. There is also a role for well-designed behavioural change programmes – but these are best tackled outside of the SCA framework.
62. It is unclear to the Council that the electricity companies are the best delivery agency for delivering large scale reduction in electricity demand. At a fundamental level energy efficiency is inimical to electricity company's commercial interests. The Council would therefore recommend that this service be opened up to competition. The cost of the service would be borne by the electricity customer and perhaps also Government and there would need to be detailed consideration of how the levy would be distributed across different classes of customer. There would be merit in having segregated funds for household and business customers. In particular, the Council would also like energy efficiency activity to be more concentrated on poorer households.
63. This sort of policy is already well established in US where the state regulators have been mandating electricity companies to install electricity saving measures in the homes of their customers for some decades. Annex 2 gives details about two different models. The Californian model is long established and it has resulted in California's per capita electricity consumption being constant for almost 40 years, while electricity usage of other states has carried on rising. The other model is where electricity customer money is collected by the utility but then transferred to an energy efficiency utility. This model is found in Vermont and Maine.
64. RAP Online have published a report on the effectiveness of different parties administering energy efficiency obligations²⁶. Housing charities have been involved

²⁶ RAPOnline (2011) "Who Should Deliver Ratepayer Funded Energy Efficiency? A 2011 Update"

in discharging energy efficiency installation and training especially in social housing in US and UK.

65. The Council advocates that mandatory energy efficiency programmes offer excellent cost effectiveness. The Council recommends that responsibility to deliver the energy saving targets is open to competition. If the electricity companies are selected to deliver some of the energy saving goals then it is important that their profitability is not undermined by dint of successfully delivering their energy saving targets. The present SCA creates a conflict between reducing energy use and the electricity company's which need to recover its fixed costs. There is a body of literature from the US on how to decouple incentives for energy efficiency from the electricity company's incentives to maximize sales of power and these partly mitigate the problem.

How would demand side response fit with the SCA?

- i) Government must first establish a list of the electrical appliances and building heating and cooling systems that need to be made more energy efficient
- ii) Energy savings calculated on the *incremental* energy saving from purchasing the apparatus being incentivized, compared to the apparatus that would otherwise have been purchased. The assessment is based on lifetime electricity savings. This list of energy savings forms the *tariff* for determining how much credit the energy efficiency utility will obtain for subsidizing the measure.
- iii) Optionally, an extra tariff might be calculated for decommissioning and safely disposing of *still-operating* energy inefficient appliances.
- iv) One or multiple energy efficiency delivery company should be selected. The Council recommends that this be opened up to competition including not-for-profits and others that might have relevant skills or access. This might include property managers, especially for targets to improve commercial buildings.
- v) A target for energy efficiency savings over a 2-3 year period is agreed and a corresponding budget for the amount of electricity-customer bill that may be spent. The target should reflect the available technical potential based on the usual rate of turnover of electrical equipment. It should reflect the savings over the entire lifetime of the investment. If the programme includes installation of HVAC (heating, ventilation and AC) the target should reflect any constraints on skills or suitably qualified installation workers. Targets are given energy efficiency delivery agency.
- vi) Costs of the levy for energy efficiency are treated as operating spending and passed through to customers. The Council strongly recommends that fuel poor households do not bear excessive costs and that there are

sub-targets to install measures in their homes, for free.

- vii) The electricity companies' tariffs might need to be adjusted to compensate them for some losses of revenue arising from the reduction in sales.

Instrument for Renewables

66. The SOC's incentives for RE deployment are not well designed. The renewables target requires the electricity companies to produce 1%, 2% etc. of the electricity from renewables before the incentive-ratchet is applied. There is also an 11% permitted RoR allowed for investment in renewables. Using ANFA style system for incentivizing renewables investment is an ineffective way of encouraging renewables. These technologies are highly capital intensive per kWh of delivered electricity but have low operating costs. Allowing generators an even higher RoR on their capital costs than the current 9.99% exposes consumers to higher tariffs, increases company profits, without disciplining the electricity companies to invest in the cheapest technology, the best site for deployment or run the technology in such a way to maximize power output. Other countries have largely stopped rewarding renewables with *capital subsidies* but instead pay *on results* supporting the technology through a *per-unit of electricity delivered* payment system. The feed-in tariff is now found in 60 countries, the renewable portfolio standard is also used for instance in South Korea and California. The Council believes that these mechanisms can be made to work within the scheme of control.
67. The current system for rewarding embedded generation is completely ineffective. It requires small scale distributed generators of very weak bargaining power to enter into negotiations with their suppliers. The Council knows of no case where a small-scale generator is paid for electricity spilt onto the distribution grids. They are essentially being asked to provide electricity to their supplier for free. This is perverse since small scale PV (the most common sort of distributed generation in Hong Kong) mostly produces electricity on hot summer days when demand is highest.
68. The best mechanisms for supporting renewables strike a balance between the interests of the RE developers and the interests of consumers paying the subsidy. Renewable technologies are highly modular and the capital costs have declined markedly over time as manufacturers have achieved economies of scale and RE developers have become more experienced at their deployment.
69. The Council believes any support mechanism should pay the RE developer a predictable sum for delivery of renewable electricity, this way the RE developer bears the costs if they fail to efficiently plan and deploy the technology, but they do not bear the costs of volatile wholesale electricity prices, arising from the fossil fuel market. An efficient RE developer will a) deploy the right technology, b) at the right location, c) secure the cheapest source of finance and d) maintain the facility well to ensure it continues to produce electricity through its life.
70. The economics of renewables is fast changing as the technologies improve. The

level of tariff paid for new installations needs to be regularly reviewed to ensure consumers get the best value for money.

71. Most countries have settled on the feed-in tariff or some variant as the preferred mechanism for supporting renewables. A recent variation is a reverse auction feed-in tariff²⁷ where renewable developers are invited to bid for the level of support they will need to produce a given amount of renewable electricity for the next year or so. Brazil pioneered this sort of instrument and recent auctions have resulted in developers committing to producing on-shore wind for remarkably low prices.
72. Table 2 shows results from a recent UK reverse auction²⁸. The prices are the strike prices that the RE developer will receive for any RE power they generate²⁹. The energy-from-waste strike price was *below* the prevailing wholesale reference price so would receive no subsidy! Interestingly, the auction resulted in a small amount of utility scale PV (20MW) bidding in for feed-in tariffs below on-shore wind and just 33% higher than the wholesale price of electricity. If feed-in tariffs in Hong Kong are set at a similar level to those found in UK, the added cost of supporting renewables in Hong Kong will be modest. In the case of energy from waste, little support would be needed.

Table 2: Strike prices for RE power announced in UK February 2015 feed-in tariff auctions, the average January wholesale price of power, and HK retail price

	£/MWh	HK\$/kWh
UK wholesale prices		
Offshore wind	115	1.32
Onshore wind	80	0.92
Large scale solar PV (20MW)	50	0.58
Energy from waste	45	0.52
Average wholesale power price*	46	0.53
Hong Kong now retail		
Hong Kong 2020 (retail)**		1.4

* UK wholesale electricity price for January 2015 is shown as the relevant reference price for non-renewable power price

** average retail price in Hong Kong (which also includes distribution, transmission and retail costs) is shown for comparison purposes

73. The tariff paid to off-shore wind farms from the reverse auction are substantially lower than historic off-shore wind support prices and lower than the feed-in tariff promised to UK's new nuclear plant. The Council believes the use of a mechanism

²⁷ World Bank (2011) "Electricity auctions – An overview of Efficient Practices"

²⁸ Department of Energy & Climate Change (2015) "CFD Auction Allocation Round One - a breakdown of the outcome by technology, year and clearing price"

²⁹ The operation of the UK contract for difference price support is significantly more complicated than the description given here

like the auctioned feed-in tariff is a less expensive mechanism for supporting the deployment of RE than the present +1% RoR and also ensures risk of non-performance is borne by the RE developer. Annex 1 illustrates this point.

74. The Council recommends the Government quickly implement a feed-in tariff similar to that used in other countries. It notes that one of the power companies has already indicated its willingness to pilot a feed-in tariff within Hong Kong. The Council's own modelling suggests the tariff impacts of even a 5% penetration of waste and solar PV will have a modest impact on consumer bills, much lower than the bill effects of a projected change from coal to gas. The Council has already indicates its strong preference that the feed-in tariff should be available to all RE developers on a non-discriminatory basis.
75. Development of larger RE plant such as off-shore wind will be too large to be considered distributed energy, and will need to be linked to the transmission system. The Government will need to discuss with the energy companies appropriate access codes and protocols to ensure fair access and funding for any consequential investment in transmission.

How would the feed-in tariff fit with the SCA?

76. It is important that the feed-in tariff discussed above fits in within the existing architecture of the SCAs. In the steps below it is assumed that the instrument will be an *auctioned* feed-in tariff. The alternative of a feed-in tariff with a preannounced support price might be considered more practical given the immaturity of the renewables market. The steps are:
 - i) Government updating its analysis of the cost and potential scale of at-scale renewable, with a view to publishing a short list of locations that wind, utility-scale solar PV and energy from waste would be permitted. These would form the basic inputs needed by the RE developer to make a site assessment.
 - ii) RE developers are asked to signal their interest in sites and their preparedness to apply for a feed-in tariff / participate in an auction
 - iii) Parameters are set on the amount of renewables being sought in an auction for different technologies, and the maximum price that consumers would be asked to pay, to contain aggregate costs
 - iv) A funding mechanism would be agreed with the electricity companies to finance the feed-in tariff. This would appear transparent on the bill. In other countries the order to set up the feed-in tariff fund has been introduced via primary legislation. The negotiation would also include requirements for access to the grid and agreements on how the cost of extending the transmission & distribution system would be shared between the RE developer and the incumbent electricity supplier
 - v) Bids would be invited from firms (including the incumbent electricity

companies) on how little subsidy they would need.

- vi) The payments into the feed-in tariff fund would be recorded as operating spending and allowed to be passed through to consumers. There would be offsetting savings as some of the expenditure on fossil fuels and the cost of building new plant under the ANFA would be avoided.
77. In the UK, the Renewable Obligation (RO) (a tradable renewable portfolio scheme with a maximum buy-out price to prevent excessive cost to consumers) came into force in 2002, two years after the primary legislation was passed. The RO replaced an earlier capital grant subsidy, the Non-Fossil Fuel Obligation (NFFO) which ran between 1990 and 1998. This indicates how quickly a new scheme can be introduced. The tradable nature of the RO meant that the RE developer could either be one of the major electricity companies or an independent RE developer that sold the certified renewable electricity to electricity suppliers. The RO was the main mechanism for supporting large-scale renewables until the recent change to auctioned feed-in tariff.

Q6. DO YOU HAVE ANY OTHER COMMENTS AND SUGGESTIONS?

Energy Commission and greater transparency

78. The Council's suggestions about policies and new incentives to ensure the roll-out of energy efficiency, investment in renewables, and fair access terms for distributed generation will require on-going dialogue with the electricity companies. Independent analysis needs to be commissioned and overseen to assess major infrastructure projects like the need for interconnection between Hong Kong Island and Kowloon, between Hong Kong grid and the mainland, and about the practicality of converting the town gas network to natural gas. There will have to be thoroughly assessed monitoring to ensure the targets are being met and any unintended consequences are quickly addressed. This will require a critical mass of skilled personnel expert in energy issues. There is strong interaction between the electricity market, the gas market, energy efficiency deployment and the road fuel markets. All are highly concentrated industries. All are heavily impacted by global fossil fuel markets. The Council believes it important for Hong Kong to have an integrated and holistic energy policy that balances the different energy objectives that takes a long term view over the 20-30 years of the new generation assets useful life. The Council believes that an Energy Commission needs to be established to ensure these different Government energy policies are all taken forward in a concerted way, making best use of scarce expert staff knowledgeable about regulation, energy markets. The Energy Commission would perform a critical advisory role to the Government in designing this energy policy, and would be responsible for all governance and enforcement arrangements.
79. The Council welcomes Government's support for the publication of segmented accounts. This will improve the visibility of financial data for generation, distribution

and supply.

80. But the Council also calls for greater transparency of the data submitted for Tariff review and Development plans to enable stakeholders to have confidence that customers are paying reasonable prices for new capital projects, and that the capital projects are justified. The electricity companies are *de facto* monopolies. In exchange for their continued right to operate, they should recognize stakeholder's desire to scrutinize their business affairs carefully.
- i) *Cost data*: At the moment the projected cost data in the Development Plans is withheld as commercial sensitive. The Council appreciates that some project level data might be sensitive but stakeholders are interested in seeing projected costs especially for politically significant projects like Lamma Wind, at least a range should be provided if precise figure cannot be given. For smaller projects data aggregated by purpose would suffice: e.g. new generation, decommissioning old plant, transmission lines to a major new development etc.
 - ii) *Electricity demand forecasts*: The public should be able to see data on the two companies' forecasts for power demand for the next five years for different class of customer (household, transport, commercial and industrial) to see if further expansion in generation capacity is necessary and at what scale. Information on the location of projected future demand growth would also be useful to understand the background for requested spending on distribution and transmission. The Council does not agree with the companies' assertion that releasing information about future demand will help suppliers that sell services to the company gain any advantage.
 - iii) *Load curves*: Information of the time profile of electricity demand (variation in demand over the different days of the year and across the different hours of the day) would also assist the development of responsive DSM shifting activities and plan energy storage.
 - iv) *Outputs on energy efficiency*: Information about the actual savings in energy and numbers of installations installed as a result of company's DSM interventions, also which type of customer will be benefitting, should be disclosed to the public.
 - v) *Small scale renewable & distributed generation*: details on the number of renewables that have been connected to the grid and their capacity and the company's performance in terms of responding to would-be RE developers questions.
 - vi) *Consumer involvement*: it is important that consumers being involved in the defining and framing of the policy.
81. The Council believes another important role for the Energy Commission is to ensure

that such data is meaningful and is made available in an accessible way so stakeholders can provide informed and relevant comment.

82. The consultation moots several other ideas. Evidence from other countries about the efficacy of AMI is very mixed. Often household customers will face the cost of the new infrastructure, but do not see benefits from reduced demand, or shifting demand. Many of the benefits from AMI – namely reduced operational costs through avoiding meter reading, easier and earlier detection of faults reduce the operational costs of the company and the Council would like to see bills reduced to reflect these savings.
83. The Council strongly supports the idea of introducing competition into generation but would advocate accelerating the timetable to allow contestability of new generation plant in advance of the gas fired power stations that the consultation envisages. The current timetable runs the risk of a significant number of new gas fired power stations being built under the current arrangements which consumers will be locked into paying a return on the capital costs of for the next twenty-five years even though the territory is by then buying much lower carbon electricity from the mainland or domestically.

Concluding remarks

84. The Council makes a number of suggestions in this response and in its December report that call for far reaching changes in the electricity market.
85. Looking forward over the next two to three decades, the Council argues that the territory needs to reduce its reliance on fossil fuels by adopting a more systematic approach to investing in energy saving technologies and, where possible, installing renewable energy technologies. In time renewables from the Mainland, transmitting electricity through strengthened interconnections could play an important role. With this in mind the Council believes the territory should be cautious in taking forward investments in new gas fired power stations that commit consumers to paying for a technology that relies upon a depleting resource and which further adds to the stock of greenhouse gas in the Earth's atmosphere. Smaller distributed co-generating plant permits smaller increments in new capacity, save money and reduce carbon emissions.
86. In a few months China and the other major economies will be gathering in Paris to set out their proposals for cutting greenhouse gas emissions. It is important that an advanced economy like Hong Kong makes a contribution commensurate with its state of economic development. Hong Kong is a world leader in electricity safety and reliability. Over the next ten years Hong Kong should also show similar leadership in energy saving, demand shifting and distributed co-generation to meet power and cooling need. Issues about the rate of return on assets, and the precise wording of incentives and sanctions are of course important but tomorrow's consumers would not want Hong Kong to lose sight of this bigger picture.

Annex 1 – Why an auctioned feed-in tariff is superior to the +1% RoR on investment

1. A feed-in tariff is a policy in which Government agrees to pay RE developers an agreed tariff for the renewable electricity they generate. The tariff is typically updated in line with inflation but is otherwise fixed for 20 – 25 years. Traditionally the feed-in tariff rate is set by Government. However as technologies have become cheaper this backward looking setting of tariffs has tended to over-compensate RE developers. In a reverse auction RE developers bid against one another on how low a support price they need, per kWh delivered. There might be different tranches for different technologies e.g. “an auction for 100 MW of off-shore wind capacity for completion by 2019”. RE developers are responsible for designing, securing finance, building and operating the RE facility. Any risk of non-performance of the technology or delay in construction is borne by the renewable developer not the consumer.
2. Contrast this with the SCA. Under the SCA, the two electricity companies have to present 'plausible' capital costs for projects that they are proposing. These are reviewed by Government and there is a competitive dialogue to reach an agreed level of capital investment. However, there is no dynamic incentive for the firms to innovate and bring down the capital costs.
3. In the SCA profits are earned by providing a RoR on the approved capital investment. Operating costs are simply passed through. The RoR of 11% is much higher than the 6-7% cost of finance faced by RE developers³⁰. Because RE has high capital costs per kWh it exacerbates SCA's existing tendency to incentivize capital investment, and under-reward savings in operating costs. The feed-in tariff by paying an all-in price reflecting the levelised costs for RE corrects these biases in the SCA.
4. The table below illustrates the wholesale cost of electricity (in year 1) from the SCA for different levels of RoR and the observed price of auctioned feed-in tariff using up to date information from literature.

³⁰ See Reuters (29 April 2015) “New Issue - Dong Energy prices 600 mln euro 3015 bond” about the wind developer Dong Energy issuing 2 year bonds at 6.25%. Once the capital investment is made, the RE developer might refinance at lower cost or sell the project on.

Table 1: Wholesale cost of producing electricity using SCA at different RORs and through the feed-in tariff (FIT) auctioned and non-auctioned

Wholesale cost of power from off-shore wind	HK\$/MWh	
SCA @11% ROR	2652	
SCA @10% ROR	2511	
SCA @ 6% ROR	1945	
SCA @ 5.25% ROR	1838	
Observed price of non-auctioned FIT in UK	1818	indexed with CPI
Observed price of new Contract-for-Difference in UK (auctioned FIT)	1372	indexed with CPI

Source: Council staff calculations

Assumptions

Capital cost of off-shore wind US\$5600 per kW³¹, straight line depreciation over 20 years

Assumed annual output of turbine 3066kWh/kW, 35% utilization rate

Operating costs US\$50 per MWh³²

5. The Council has used up to date US Department of Energy and the International RE Agency for the capital and operational costs of off-shore wind as an indication of up to date and fairly authoritative of the “at-scale” costs of off-shore wind.
6. The costs of support of the SCA per delivered MWh are much higher than the feed-in tariff if the permitted RoR is higher than the true cost of capital. These costs are actually windfall profits to the electricity. The companies are being rewarded, by the SCA policy, for the gap between the permitted RoR and the true cost of borrowing they face. The economics of off-shore wind dictate that a high proportion of the levelised cost of electricity *is the cost of capital*. The cost of the off-shore wind drops from HK\$ 2652/MWh to 1945/MWh if the RoR is reduced from 11% to 6% - a 25% saving in wholesale costs!
7. The bottom two numbers show the observed value of Feed-in tariffs for off-shore wind. These make no use of capital costs of the schemes given in the literature. They instead reflect the improving cost effectiveness of the technology that is only revealed when firms have to compete to obtain the price support. The wholesale cost of power produced through auctioning the feed-in tariff is almost 50% less than the modelled cost for the SCA at 11% RoR, illustrating the inefficiency of the SCA at supporting technologies where costs are declining and capital costs make up a high proportion of levelised costs.

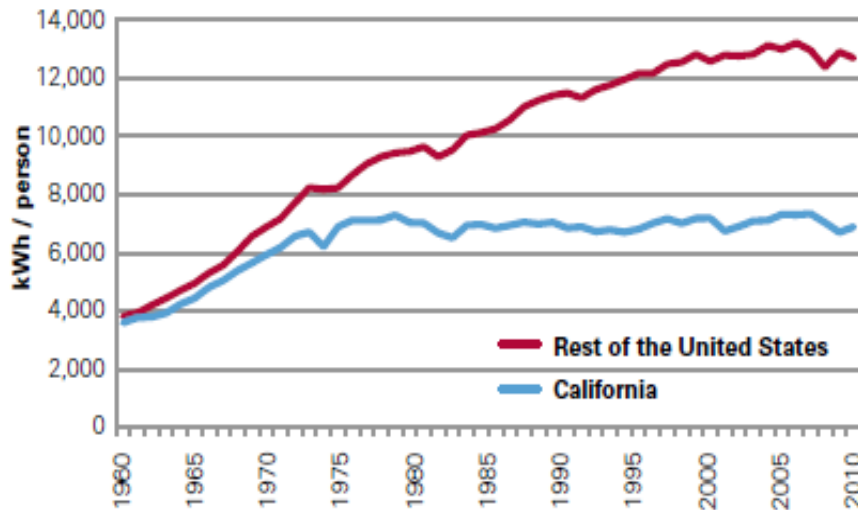
³¹ US Department of Energy (2014) “Capital Costs for Electricity Plant”

³² International Renewable Energy Agency (IRENA 2012) “Renewable Energy Technologies: Cost Analysis Series – Volume 1: Power Sector”

Annex 2: Two models for delivering energy efficiency measures financed by electricity customers

1. In the US many state regulators mandate the electricity companies to install energy efficiency measures in the homes of their customer to reduce electricity demand.

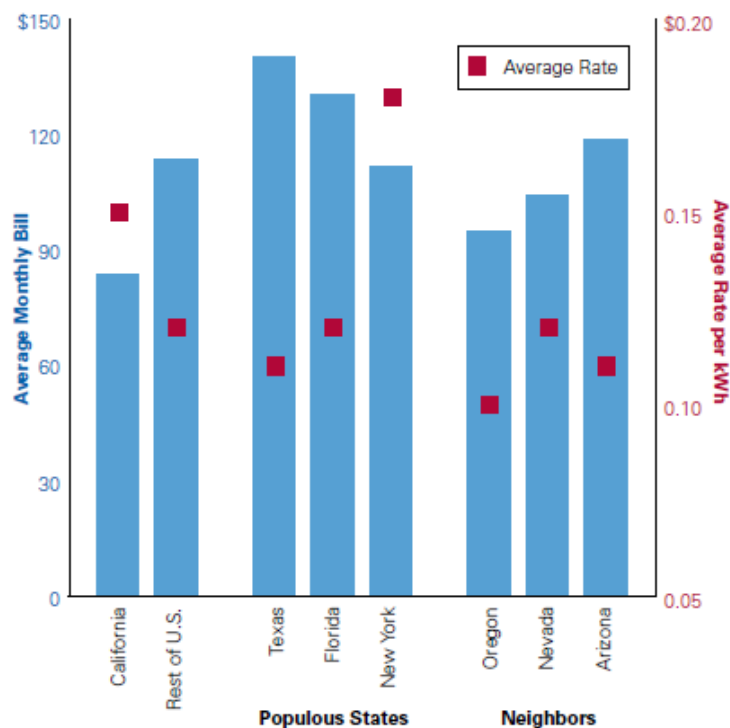
Figure 1: California Per Capita Electricity Consumption vs. Rest of the Nation



Source: EIA.⁷

2. There is good evidence from California, where such programmes have been in operation for over 25 years, of sustained and persisting reductions in energy use. The outcome of its efficiency programs is impressive. California's per capita energy use has remained flat, while the rest of the US has increased by about 33 percent, as the above graph from US Energy Information Administration (EIA) illustrates.
3. The figure below shows California's residential electric rates are among the more expensive in the US, in part because of the levies on rate payers to fund the Renewable Portfolio Standard and energy efficiency programmes. Yet the low average household consumption, arising from many years of investment in energy efficiency, more than compensates for the high unit costs of electricity, so that the average monthly bill is 30% lower than the average of the other states and lower than other nearby or heavily populated states. (See Figure 2 below).

Figure 2: Comparison of Residential Electric Bills and Rates



Source: U.S. Energy Information Administration (2011)

- California’s four investor owned utilities (IOUs) are regulated by the Californian Public Utilities Commission (CPUC). The CPUC has declared an energy hierarchy which favours investment in energy efficiency, followed by renewables, co-generation and lastly electricity-only fossil fuels. The IOUs were budgeted to spend US\$2bn on energy efficiency for the two years 2013-14³³, 20% had to be implemented by third parties. This is funded by charge on energy bills. The largest programs were on lighting upgrading, followed by improvements to Heating, Ventilation and AC systems (HVAC). Funds are also set aside for workforce training - to ensure there is a cadre of skilled installers especially for new and emerging technologies, multi-family rebates and innovative new technologies. A Californian utility (not one of the IOUs, but Sacramento Municipal Utility District a publicly owned power company) was responsible for innovations like the development of highly reflective roof tiles which aesthetically match local building materials. The IOUs are required to report the outputs of their energy efficiency portfolio in terms of the number of households and businesses that have been supported. There is a rigorous system of monitoring and evaluation to ensure measures are performing as anticipated and assessing the level of subsidy paid per unit of energy saved. Households can take advantage of rebates of between US\$50 purchasing

³³ California Public Utilities Commission (June 2015) CPUC Energy Efficiency Primer, Energy Division.

EnergyStar-Most efficient³⁴ washing machines and fridges, and up to US\$500 subsidies for large Electric pump heaters etc. There are also incentives for scrapping old fridges. There are special programmes for building owners of apartment blocks for upgrading communal heating, communal washing machines and electrical pumps (for pools). The CPUC estimates the benefits of the last nine years of programs have been \$10.4 billion and the costs have been \$8.6 billion. Benefits have exceeded costs by around \$1.8 billion.

5. The Californian system of mandating electricity companies to deliver energy efficiency has no doubt worked. But there are criticisms that there is a fundamental conflict of interest at the heart of this model, hence a good deal of resource has to be spent in monitoring and compliance. Energy efficiency means that the power companies need to build fewer power stations, invest less in transmission and distribution and therefore grow less. To an extent this has been mitigated by the “decoupling plus” which allows tariff rises to offset the fall in volumes eroding the electricity company’s ability to recover its fixed costs. But there are examples of energy efficiency programmes being ‘gamed’ by the electricity companies where money is thrown into sub-targets that are known to be inexpensive to deliver but result in few savings to the consumer. In the UK companies were for a few years flooding the market with subsidized CFL lightbulbs, and sending customers free bulbs without determining whether they were suitable or appropriate for the light fittings. Many of these bulbs remained unused. Such behavior is unusual, but it is not unusual for privately owned electricity companies to comply with the regulatory requirement in the most minimalistic fashion rather than seeing the enhancement of energy efficiency as a viable business opportunity.
6. Another model for delivering energy efficiency is for the levy to be raised from electricity customers, *but for a different organization to be awarded the contract to run the energy efficiency programme*. For instance, the not-for-profit Efficiency Vermont has since 2000 been responsible implementing the delivery of the state’s targets. Customers pay an average of US\$34/household³⁵ – one of the highest levels in the US. The energy efficiency utility has been set targets by the regulator to cut energy and peak energy consumption and its performance has been impressive - savings of 2.7% in 2012, with a spending of 4.7%³⁶ - a payback period of less than 2 years – delivering a very high rate of return of 50% for consumers. This is equivalent to a levelised cost of electricity of just US\$0.03/kWh (HK\$0.23/kWh), about a quarter of the cost of electricity in Vermont. Many US states now mandate similar schemes. Efficiency Vermont’s performance offers

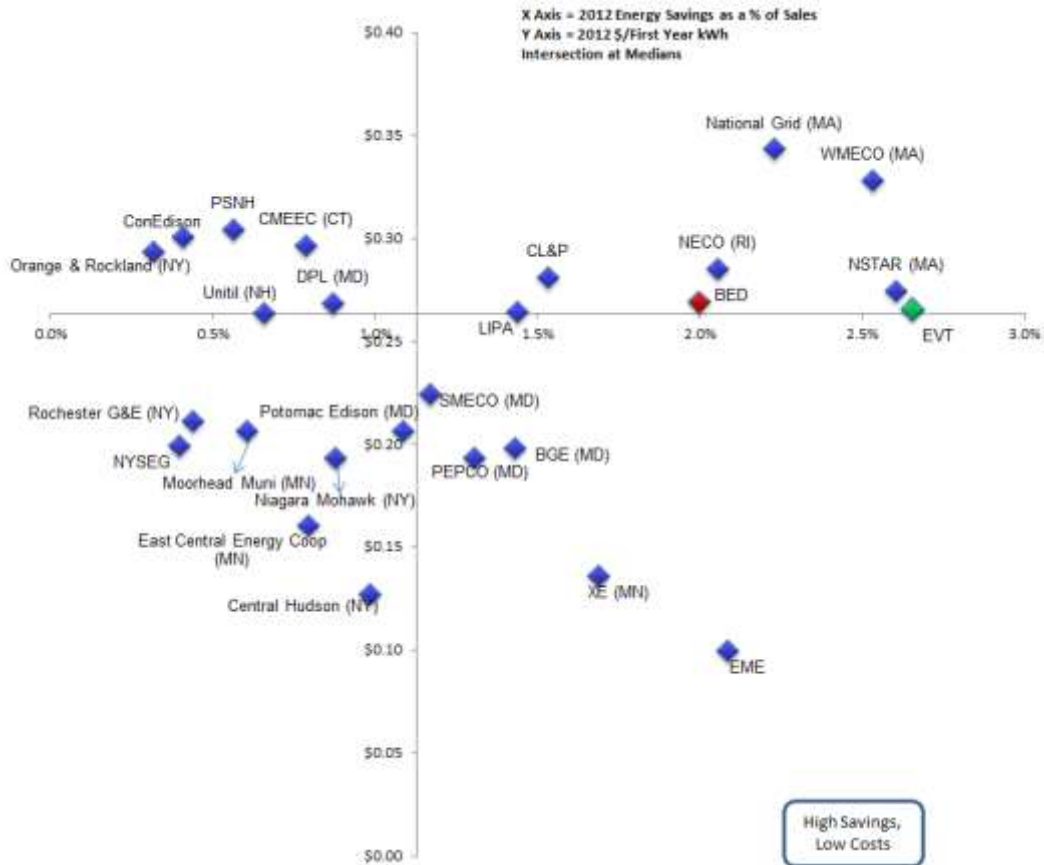
³⁴ Energy Star is a rating system operated by the US Department of Energy that seeks to identify the top 50% of products within each product category. The new “most efficient” category identifies a small number of the top energy saving products amongst Energy Star products

³⁵ There are numerous evaluations of Efficiency Vermont’s performance on the state regulators, at http://publicservice.vermont.gov/topics/energy_efficiency/eeu_evaluation

³⁶ Navigant (2014) “Benchmarking of Vermont’s 2011 and 2012 Demand Side Management Programs” Prepared for Vermont Public Services Department

slightly better value for money for other comparator programmes in North East USA but is not wildly different. In the figure below Efficiency Vermont is the Green diamond and Burlington Electric Department the red diamond.

Figure 3: Comparative analysis of spending (X-axis) and cost effectiveness (Y-axis) demand side response programmes in northern USA states in 2012



Source: Navigant (2014) op cit

- As a not-for-profit with a mission to address climate change it has voluntarily accepted unfunded targets for reducing customers' gas usage. It also works with the 20 or so electricity distribution companies in Vermont targeting its energy efficiency activities in areas where there are constraints on the distributional network to delay the need to invest in network capacity ("geotargeting" programme). This is an example of energy efficiency working to reduce the need to add to the ANFA in *the transmission and distribution system*. Efficiency Vermont has undertaken projects that go beyond activities most privately owned energy companies would do. It works with architects to ensure new homes are aligned to maximize solar gain, involved with training and certifying installers in the state and creating web-based tools enabling Vermont citizens to conduct post-code searches of certified installers and retailers of low energy products.