

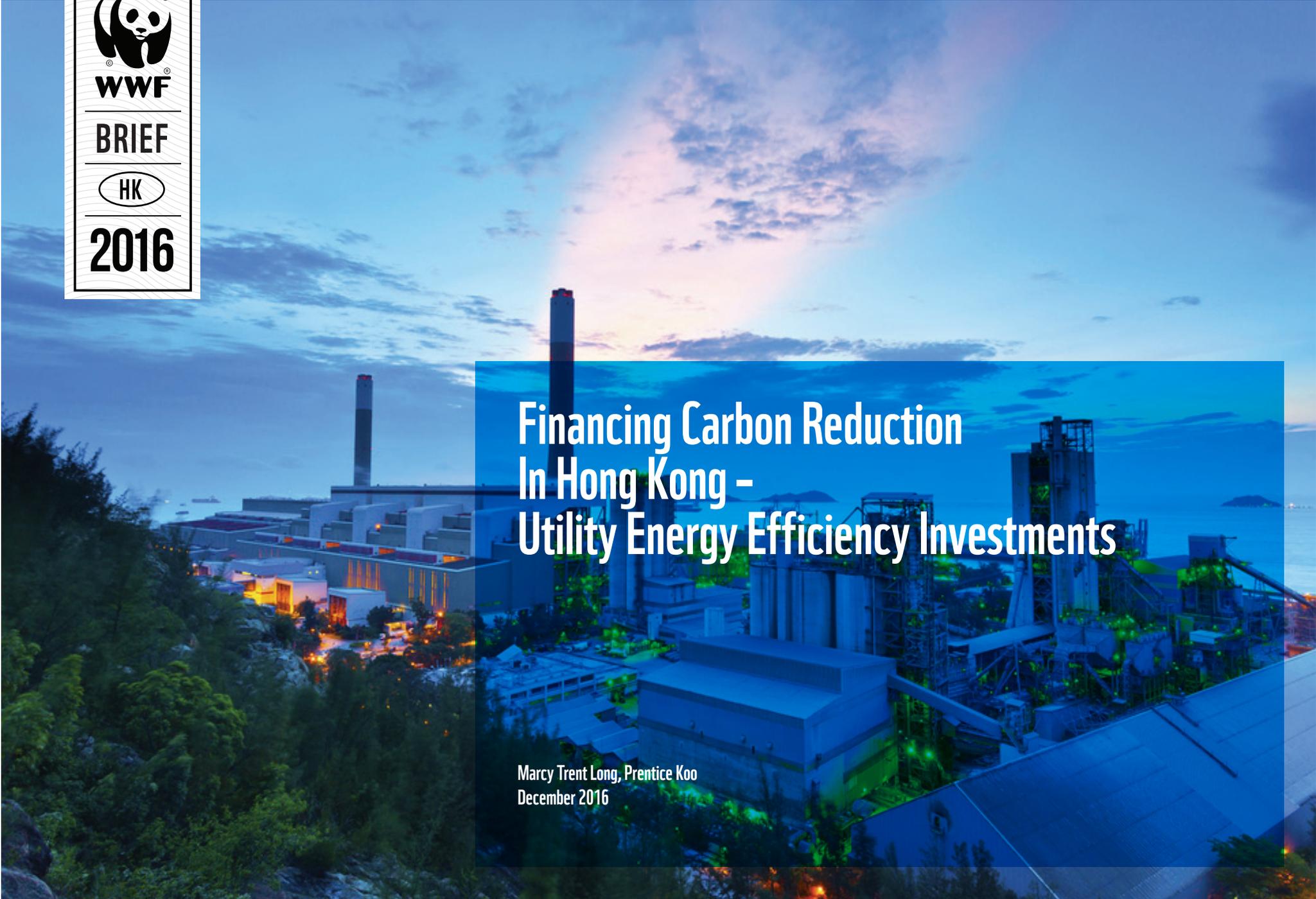


WWF

BRIEF

HK

2016



Financing Carbon Reduction In Hong Kong - Utility Energy Efficiency Investments

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INTRODUCTION

In order to reduce air pollution, Hong Kong's power utilities have moved away from coal-fired power plants to gas-fired power plants. In the last decade alone, 1,875MW of gas-fired power plants have been connected to the grid or proposed by the utilities. However the most urgent challenge for our electricity market is to reduce carbon emissions, and yet Hong Kong is still planning new power plants burning fossil fuel. WWF estimates that even with a full transition of coal to gas fuel, CO2 emissions are still expected to increase 18% by 2050 if no other carbon reduction measures are introduced.

Utility investment timeline



Black Point
Gas Plant C8
2006



Second West-East
Natural Gas Pipeline
2013



Flue Gas
Desulphurisation Plant
2009



First Combined Cycle
Gas Turbine
2006



L10 Gas Plant
2016



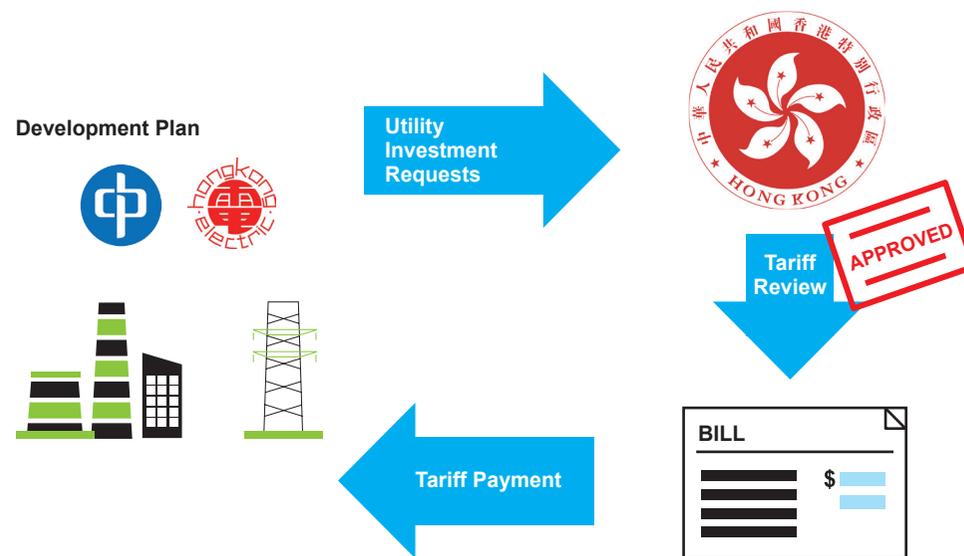
Flue Gas
Desulphurisation Plant
L4 L5
2009

This can be changed. And we now have the opportunity to make that change.

Currently generation and distribution of electricity is governed by the “Scheme of Control Agreements” (SCAs), documents between the Hong Kong government and the two power companies, China Light and Power (CLP) and Hongkong Electric (HEC). The current SCAs will expire in 2018, therefore in the coming year CLP and HEC will submit new development plans and request approval from the Hong Kong Environmental Bureau (ENB) for new power plants to be included in the SCAs. The ENB conducts a review of the Hong Kong utilities requested investments, then determines what is necessary to maintain and upgrade the electricity systems. The approved investment forms the basis for CLP and HEC electricity tariff rates.

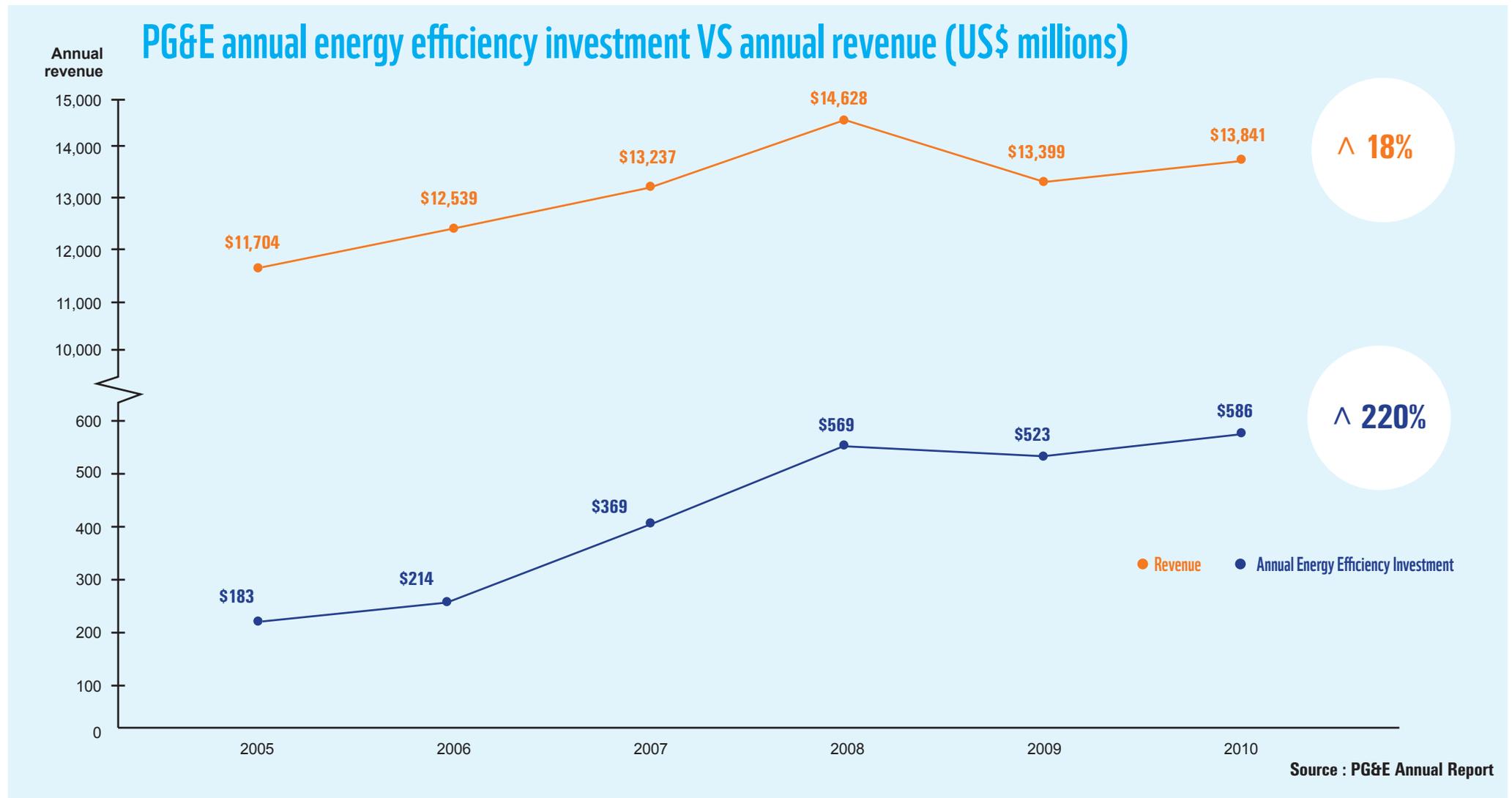
These negotiations with the electric utilities create an opportunity for the government to pursue their agenda of a carbon reduction target of 19 to 30 per cent by 2020 (2005 baseline). As an alternative to building power plants and adding more electricity capacity, many utilities across the world are instead focusing on how to reduce electricity demand through energy efficiency initiatives to tackle climate change. These programmes range from energy saving appliance rebates to loans for retrofitting buildings with energy-efficient lighting systems. If we can save electricity in Hong Kong, fewer power plants will need to be built – which would mean more carbon reduction.

How to invest under SCA



This briefing paper takes stock of where Hong Kong stands against utility investment best practices elsewhere in the world. We have chosen the US and in particular the northern California utility Pacific Gas and Electric Company (PG&E) to provide a basis of comparison with Hong Kong electric utilities' efforts to pursue carbon reduction through energy saving investments. PG&E has a similar customer base to Hong Kong: mostly commercial, non-industrial, and in a high-priced property market. Lessons can be drawn

from historical data in these electricity markets proving that energy conservation is a viable alternative to building new power plants. Moreover, these investments can be good for business: from 2005 to 2010 PG&E's energy efficiency expenditure increased by 220% whilst its overall revenue increased by 18% during the same period. Business and government leaders in Hong Kong, especially the power industry, should learn from this successful and sustainable business model.



Lesson 1

Energy efficiency investments are less expensive than the fuel

16.41

38.15

9.43

\$ 282.27

Meter reading on May 15, 2025
Relevé du compteur au 15 mai 2025
Previous reading/Relevé précédent

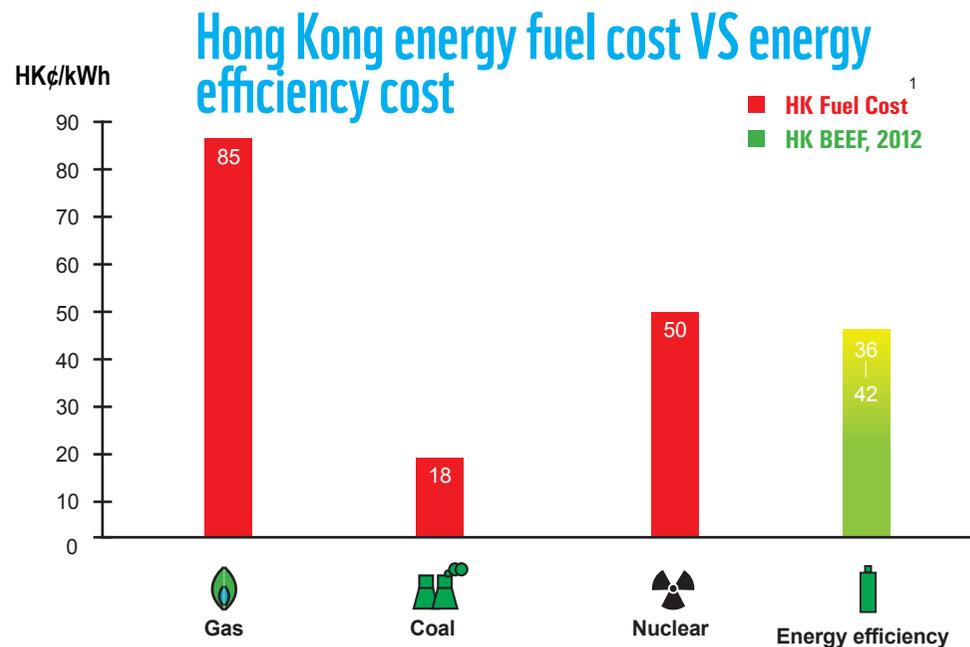
Equals current use of
Soit une utilisation de

Your electricity
Aperçu

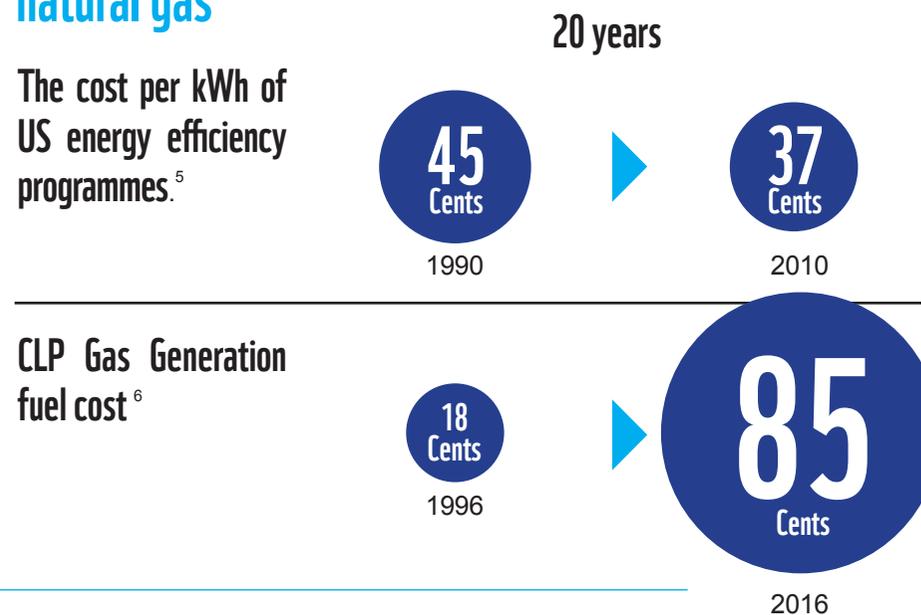
According to a 2016 study by the US government, the average cost of energy efficiency programmes in the US, on a cents per kilowatt hour basis, is 39% of the levelised cost of new gas-fired power plants and 21% the cost of new nuclear power plants.

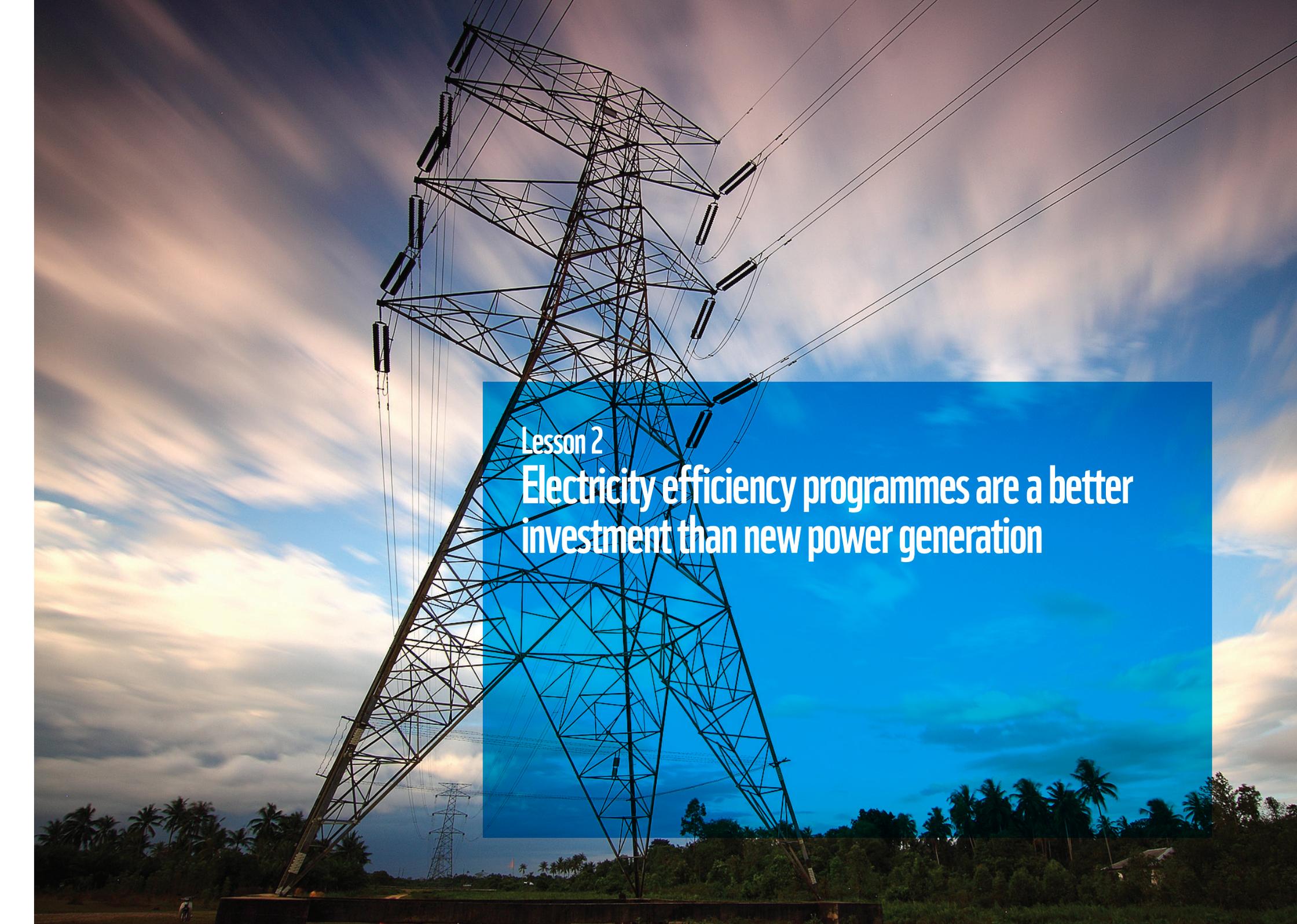
It can also be demonstrated that in Hong Kong, the cost of energy efficiency programmes, on a per kilowatt hour (kWh) basis, is substantially lower than the cost of generating electricity. For instance, the HK\$450 million Buildings Energy Efficiency Funding Scheme, which ended in 2012, was estimated to have saved 180 million kWh per year by the Environmental Bureau². Using a 6 to 7 year average lifespan³ for the programme, the average cost per kWh saving is 36-42 cents.⁴ This has been the only energy efficiency subsidy programme to date funded by the Hong Kong government. By comparison, the CLP fuel cost per unit of electricity in March 2016 was substantially higher for gas and nuclear than the energy efficiency programme cost in cents per kilowatt hour.

What conclusions can we draw from the US about the expected future cost of energy efficiency programmes? From 1990 to 2010, the US energy efficiency programme cost per kWh decreased by a net of 18%. While energy efficiency programme costs would be expected to decrease over the next 20 years, Hong Kong gas prices are expected to increase substantially. From 1996 to 2016, CLP natural gas generation increased from 18 to 85 cents per kWh. That is a 372% increase. Furthermore, the low-cost Yacheng gas fields near Hainan, China, which CLP uses to supply their gas plants, is slowly being depleted, making Hong Kong energy costs more reflective of global gas prices. For Hong Kong, energy efficiency investment increasingly is becoming a cost-effective option in long-run.



Historic costs of energy efficiency and natural gas





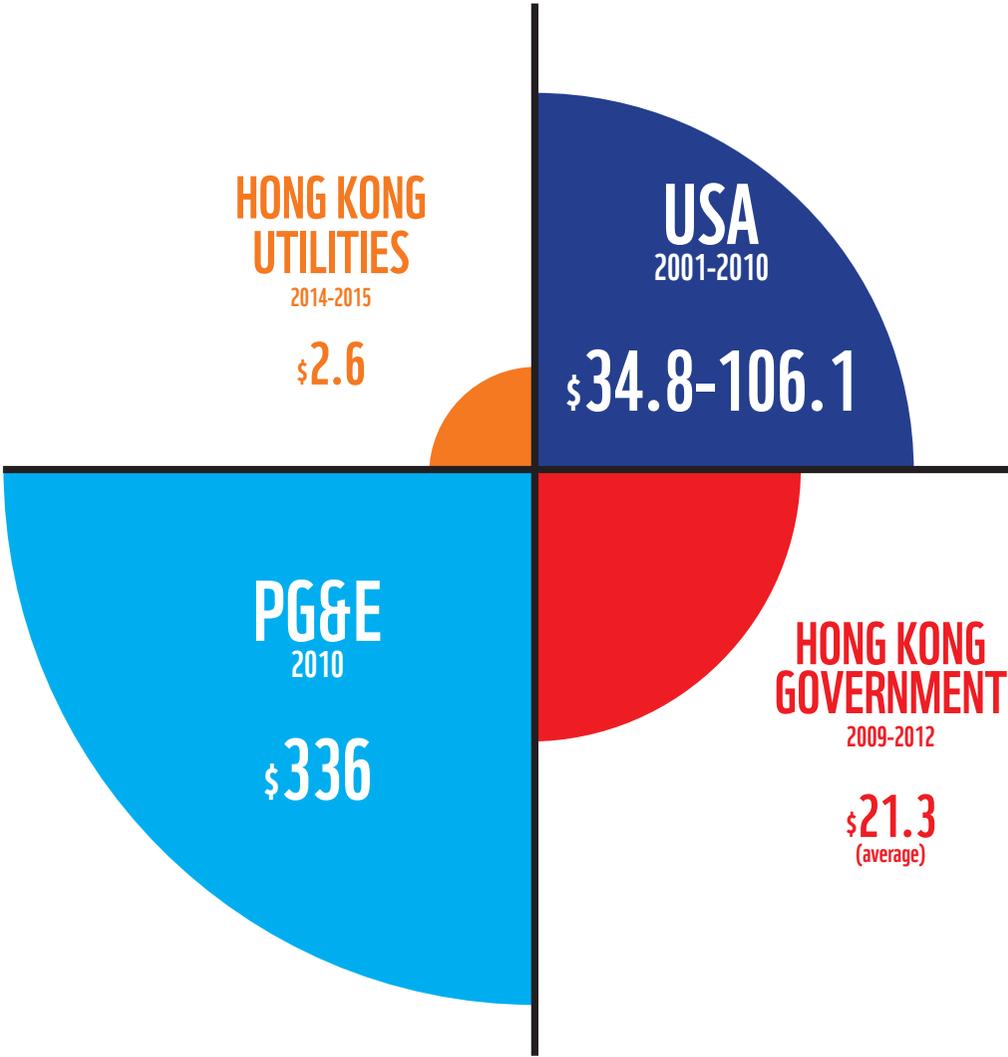
Lesson 2

Electricity efficiency programmes are a better investment than new power generation

US VS HK energy efficiency investment per capita (HK\$/capita/year)

US utilities are far outstripping Hong Kong in energy efficiency programme investment, both overall amount and on a per capita basis.

PG&E was serving over 9.5 million customers in 2010, and its per capita energy efficiency investment reached HK\$336. From 2009 to 2012, the Hong Kong government initiated its first-ever energy efficiency programme: the Buildings Energy Efficiency Funding Scheme, which cost HK\$450 million, or HK\$64 per person. In 2014 to 2015, the government for the first time approved energy efficiency programmes under the Scheme of Control Agreement for HKE and CLP totalling HK\$19 million, or HK\$2.6 per person.



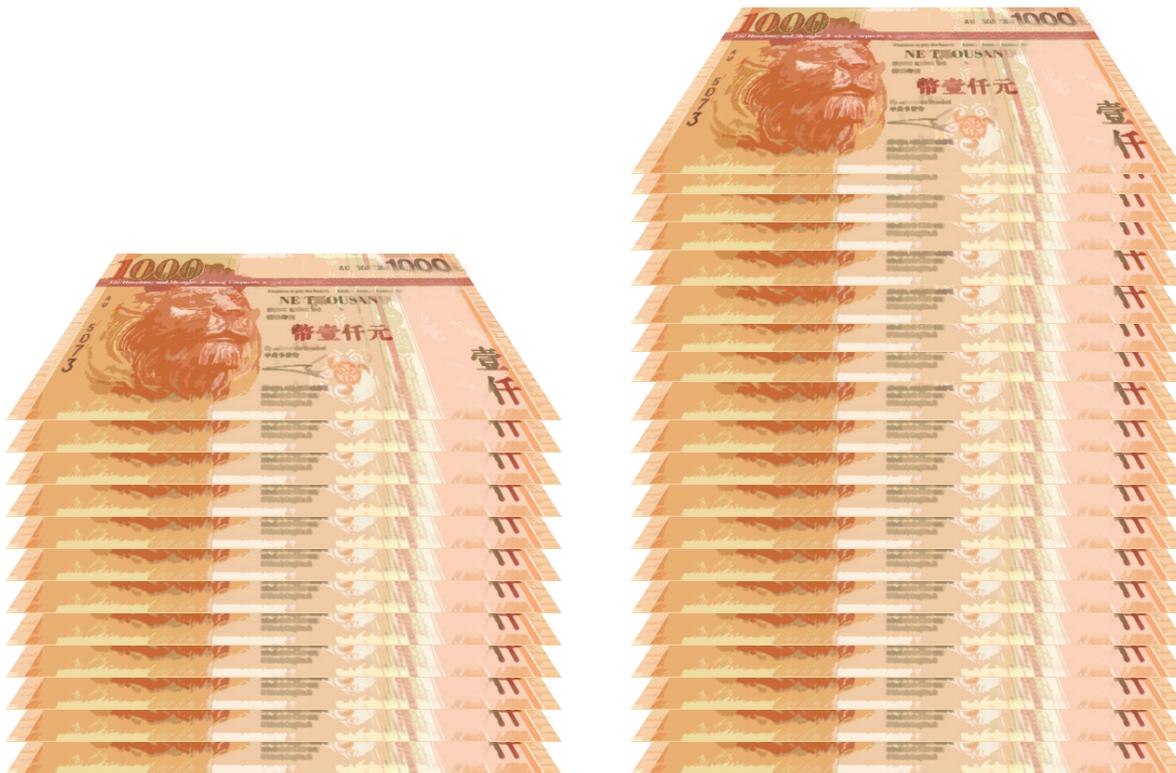
By comparison, from 2006 to 2015, Hong Kong utility customers invested HK\$60 billion, or HK\$8,200 per capita, in pollution prevention retrofits to existing plants and new gas power plants to create a cleaner fuel mix. What would be the outcome if that level of funding was invested in energy efficiency programmes?

Customer-funded Hong Kong utility investment under SCA (HK\$ per capita)

Approved assets in 2006
\$13,785

Approved assets in 2015
\$21,143

Energy efficiency investment per capita:
\$2.6



PG&E, which serves the northern two thirds of California, stated in its 2013 *Energy Efficiency Report* to the Public Utilities Commission in California that its HK\$660 million of energy efficiency investment had resulted in savings of 87MW.⁹ These energy efficiency costs were specifically related to long-term, non-residential retrofits, which had resulted in permanent peak load savings of HK\$7.59 million per MW for the utility. Based on the latest CCGT project from HEC, WWF determined that the cost of 1MW gas power capacity is HK\$8.57 million. If we apply this cost savings ratio to the new power generation assets that are being planned or discussed in Hong Kong, investing in energy efficiency would be less expensive than building new generators. We propose three alternative scenarios on the right.

Proposed gas plant and their energy efficiency alternatives

HEC

350MW gas-fired power plant,
on-grid by 2020

Minimum cost: HK\$ **3** billion

350MW energy efficiency alternative

cost: HK\$ **2.66** billion

which creates 1,062GWh
annual saving

CLP

600MW gas-fired power plant,
on-grid by 2020

Minimum cost:
HK\$ **5.142** billion

600MW energy efficiency alternative,
on-grid by 2020

cost: HK\$ **4.552** billion

which creates 1,821GWh
annual saving

CLP

1.2GW gas-fired power plant,
on-grid by 2020

Minimum cost:
HK\$ **10.284** billion

1.2GW energy efficiency alternative,
on-grid by 2020

cost: HK\$ **9.103** billion

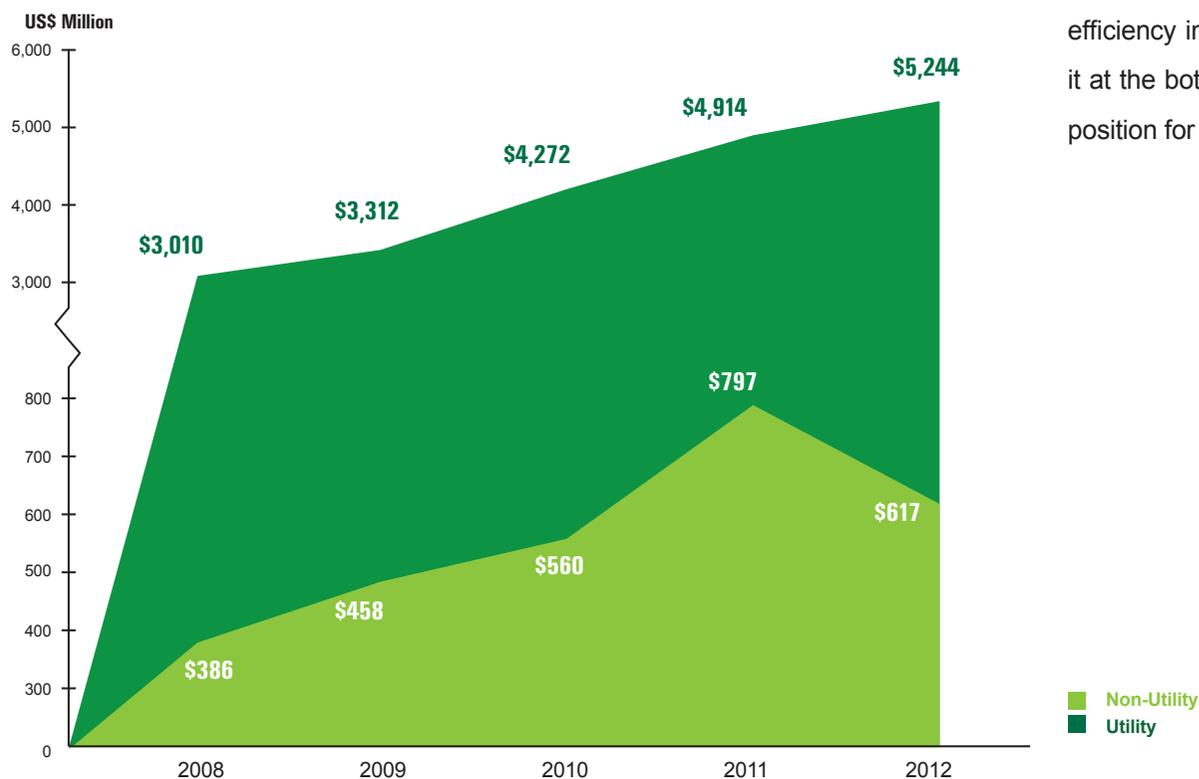
which creates 3,641GWh
annual saving

A photograph of a large industrial facility, possibly a refinery or chemical plant, featuring numerous tall distillation columns, storage tanks, and complex piping. Several smokestacks are visible, emitting plumes of white smoke against a clear sky. The entire image has a blue color overlay.

Lesson 3
Utility financing is common practice

US electric utilities are responsible for over 80 per cent of the total customer-funded electric efficiency expenditures nationwide in recent years.¹⁰ The funding for these programmes may come through an SCA-type approval process. Some funding represents a special assessment direct from the government on utility bills. These different sources of funding enable electric utilities to be able to invest on energy efficiency. And energy efficiency investment complements the business of the utilities. Therefore, the utilities are willing to invest.

Electric Efficiency 2008-2012 U.S. Expenditures



According to recent US research¹¹, spending on electric and gas efficiency programmes (excluding load management programmes) by 2025 is projected to double from 2010 levels to US\$9.5 billion in the base scenario, with US\$15.6 billion in the high case and US\$6.5 billion in the low scenario. In order to achieve the improvement in energy efficiency, 29 states invested over 1% of statewide electricity revenues on efficiency programmes.¹²

By comparison, Hong Kong's percentage of electricity revenues attributable to energy efficiency is only 0.04 per cent¹³ based on the HK\$19 million SCA-approved energy efficiency investment programme with CLP and HEC in 2014-2015. This would place it at the bottom fifth of the US chart near Guam, Puerto Rico and Alaska – not a great position for Hong Kong.

2014 Electric Efficiency Programme Spending by State (Energy efficiency spending % of statewide electricity revenue)

Energy efficiency spending / % of statewide electricity revenue



CONCLUSIONS

The latest International Energy Agency report stated: “Achieving the potential energy savings of the 2DS [2 degree scenario] in the buildings, industry, and transport sectors would entail combined additional investment costs of US\$3 trillion between 2016 and 2050.”¹⁴ It is clear that the US is far outstripping Hong Kong in its per capita expenditure on energy efficiency programmes.

Instead of focusing on building 1.55 GW gas-fired power plants, we believe Hong Kong utilities should create a proposal to spend the same amount of money on energy efficiency programmes. PG&E has demonstrated that it can reduce the need for new power plants with long-term retrofit energy efficiency programmes. Hong Kong assumes that it needs to increase power generation to meet the demands of its growing population, but has not investigated energy efficiency programmes as an alternative. As part of the SCA, shouldn't the government request a proposal from utilities for an energy efficiency programme that matches the investment needed for the power plants?

If the Hong Kong government fails to divert investment from generation to energy efficiency programmes through the SCA, we foresee a deadlock in long-term carbon reduction, which might lead to a failure to adhere to the goal of “holding the increase in the global average temperature to well below 2°C above pre-industrial levels” in the Paris Agreement.

Three key lessons for Hong Kong:

- 1. Hong Kong energy efficiency programmes have proven to be less expensive than gas-fueled electricity. Gas prices are rising, while the costs of efficiency programmes are decreasing.**
- 2. Energy efficiency programmes can offset the need for new fossil fueled power plants.**
- 3. Utility financing and managing of energy efficiency programmes is a common practice, and Hong Kong utilities are significantly lagging global best practice expenditures.**

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2. Press release, Hong Kong Government, 2013 <http://www.info.gov.hk/gia/general/201306/19/P201306190385.htm>
3. Source: Energy Savings Lifetimes and Persistence: Practices, Issues and Data, Lawrence Berkeley National Laboratory, 2015
4. Total cost: \$450 million / kWh Saving (180 million kWh) x 6-7 year lifetimes = 36-42 cents/kWh
5. Tables 9.1, 9.6 , and 9.7 Electric Power Annual 2010, 2011, US Energy Information Administration. <http://www.eia.gov/electricity/data.cfm>.
6. Natural Gas Supply to CAPCO/CLP – An introduction to LegCo Panel on Economic Development, 2013 <http://www.legco.gov.hk/yr12-13/english/panels/edev/papers/edev0108cb1-401-1-e.pdf>
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8. 2006-2015 CLP & HEC annual report
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10. Table 3, Summary of electric utility customer-funded energy efficiency savings, expenditures, and budgets, Issue Brief, 2014, The Edison Foundation, Institute for Electric Innovation
11. Barbose, G.L., Goldman, C.A., Hoffman, I.M., Billingsley, M.A. The Future of Utility Customer-Funded Energy Efficiency Programs in the United States: Projected Spending and Savings to 2025, Energy Efficiency Journal DOI 10.1007/s12053-012-9187-1, 2013.
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13. 2014 utilities energy efficiency investment divided by SCA CLP & HKE revenue =19M/ (35303M +10504M)
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