City University of Hong Kong
Research Centre for Sustainable Hong Kong[1]

Policy Paper 22[2]

Refining "Market Control" and "Commercialisation Mechanism" Policies to Accelerate Energy Transition in Hong Kong

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1. Introduction

A study by the Legislative Council of Hong Kong reveals that 'power generation' accounts for 60% of Hong Kong's greenhouse gas emissions. This share is higher than the global average, countries in the Organisation for Economic Co-operation and Development (OECD) or in Singapore (Table 1). The tertiary sector is the mainstay in the economy of Hong Kong, so emissions from industry and agriculture remain low. This also drives home the eminence of reducing emissions from power generation, in order for Hong Kong to achieve its midterm reduction targets by year 2035 and carbon neutrality by year 2050.

Table 1. Annual greenhouse gas emissions by sector

	Hong Kong	Singapore	OECD	Worldwide
Power generation	60%	39%	30%	34%
Transportation	20%	14%	23%	15%
Industrial production	5%	45%	30%	24%
Waste	9%	1%	3%	--
Architecture	6%	1%	10%	6%
Agriculture	--	--	10%	22%
Other	--	--	3%	--

Source: Decarbonization strategy in Shenzhen and Singapore (2022), Legislative Council Research Group, Legislative Council of the Hong Kong Special Administrative Region of the People's Republic of China

1 Established in June 2017 by a cross-disciplinary research team, the Research Centre for Sustainable Hong Kong (CSHK) is an Applied Strategic Development Centre of City University of Hong Kong (CityU). CSHK conducts impactful applied research with the mission to facilitate and enhance collaborations among the academic, industrial, and professional service sectors, the community, and the government for sustainable development in Hong Kong and the Region. Linda Chelan Li, Professor of the Department of Policy and International Affairs at CityU, is Centre Director.

2 This policy paper is the second part of the 3-part CSHK Hong Kong Emission Reduction Policy Research Series. To view the first part, click here. To comment on this policy paper, email sushkhub@cityu.edu.hk.

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The Hong Kong government and two major electric companies (China Light and Power (CLP) and Hong Kong Electric) have announced the goal to phase out all coal-fired power plants by 2035, and doubled down efforts on renewable energy to increase the proportion of electricity generated by renewable fuel from less than 1% to 10%. In this paper, we apply the framework of 'pull and push' policy tools discussed in Policy Paper 21[4] to identify (1) 'carbon taxation' as a viable 'market control' measure, and (2) 'technology standardisation and promotion of climate risk investment' as a measure under the 'commercialisation mechanism'.

2. Energy Transition: work in progress

The Hong Kong government outlined a two-stage roadmap to achieve carbon neutrality by 2050. In the first stage, the government shall decommission all coal-fired power plants and increase the proportion of electricity generated by renewable fuel from below 1% to 7.5% to 10%, which includes wind power (3.5% to 4%), waste-to-energy (3% to 4%) and solar energy (1% to 2%). By the second stage, Hong Kong should achieve net zero carbon electricity generation before 2050.

CLP and HK Electric have also rolled out measures (Table 2) to achieve their emission reduction targets. CLP will replace the coal-fired power plants at Castle Peak with two new gas-fired power plants at Lung Kwu Tan. HK Electric will transit from 'coal-to-gas' by constructing three gas-fired power plants on Lamma Island. Research indicates that generating one megajoule (Mj) of electricity with natural gas will result in 5,6000 kilograms of carbon dioxide (Co2), which is 40% less than generating electricity by coal (94,000 to 96,000 kg of Co2 emitted for every 1 Mj of electricity). Therefore, substituting coal with natural gas for power generation is effective in reducing emissions.

CLP and HK Electric have plans to increase investments in renewable energy: CLP focuses on electricity generation with 'waste-to-energy', 'wind plants' and 'solar energy' projects; while HK Electric will focus on building large-scale offshore wind plants around Lamma Island.

Table 2. CLP and HK Electric on emission reduction

	CLP	HK Electric
Decommissioning and replacement of coal-fired units	Replace the coal-fired power plants at Castle Peak with two new gas-fired power plants at Lung Kwu Tan	Building three gas-fired power plants on Lamma Island and realize the power transition of coal to gas.
	Open an Offshore LNG Terminal on open waters of Hong Kong	
Developing renewable energy	- Construction of biogas power generation project in New Territories West Landfill (waste-to-energy) - Construction of offshore wind farms (wind energy) - Promotion of grid-connected solar power generation (solar energy) - Research on hydrogen power generation	- Construction of 'offshore wind farm' in the waters of Lamma Island, which will account for about 4% of the total power generation (wind energy); - Strengthen the construction of solar power systems

Source: The Environment and Ecology Bureau, CLP and HK Electric.

4 The six policy tools include: Regulatory Reform; Market Controls; Commercialisation Mechanisms; Financial / Fiscal Mechanisms; Direct Investment; and Governance Mechanisms. For further information on the six policy tools, please refer to our Policy Paper No. 21: Linda Chelan Li, Yunhong Liu, Liang Dong, Phyllis Lai Lan Mo, Kin On Li (2023), The Policy Framework to achieve emission reduction targets

Despite the plans, coal still accounts for 20% to 50% of the fuel mix for electricity generation for both CLP and HK Electric, whilst renewable fuel only produces less than 1% of electricity % (see Table 3), so it will be tough for the two major electricity companies to phase out coal and achieve their renewable energy targets by 2035.

Table 3. Fuel Mix for Electricity Generation for CLP & HK Electric

	CLP	HK Electric	2035 (Target year)
Coal	About 20%	About 50%	0%
Natural gas	About 50%	About 50%	About 90%*
Nuclear energy	About 30%	--	
Renewable Energy	Below 1%	Below 1%	7.5% to 10%

* Includes other low-carbon energy sources, such as hydrogen energy. Data sources: Online information of the Environment and Ecology Bureau.

The Scheme of Control Agreements (SCA) (2018-2033) stipulates the two power companies to recognize the government's targets on reducing carbon emissions, to tackle climate change and lower emissions to improve regional air quality. However, it remains vague on how and when to achieve these emission targets, and the agreement merely focuses on the incentive and penalty mechanism resulting from the profit return adjustment of electricity tariffs and guarantee of electricity supply.

3. Policy recommendations

We suggest the government to accelerate the power transition for Hong Kong with the following measures.

3.1. Market Control: introducing a 'carbon tax' to phase out coal power and develop renewable energy

Carbon tax aims at reducing carbon footprint by exerting cost pressure on companies and individuals. Singapore charged a carbon tax of USD 11 per ton of Co2 (approximately HKD 86) in 2019, and will progressively increase the tax to USD 29 (about HKD 227) by 2030.

Hong Kong should take similar measures, communicate with CLP and HK Electrics and decide on the timetable to decommission the coal power plants, If they cannot dispose the power plants on time, carbon tax will be imposed. Additionally, the government should agree on the proportion of electricity generated by of renewable energy with CLP and HK Electric; and levy carbon tax on them if they could not produce the target amount of electricity by renewable energy.

The Hong Kong government can also implement a trading mechanism and incentivise CLP and HK Electric to produce more renewable energy, giving each company the right to purchase carbon from each other in case one of them fail to reach their emission reduction targets.

3.2. Commercialisation Mechanism: Improving 'Technical Standardisation' to promote renewable energy generation

Technical standardisation establishes a unified standard to facilitate goods and services achieve international recognition, and local enterprises engage in global renewable energy projects with capital, technology and marketing support. Singapore is the market leader in the certification and standardisation of solar photovoltaics, and it actively promotes international cooperation and technology transfer of renewable energy projects. In comparison, Hong Kong lags behind in technical standardisation, but we can capitalize on the huge market in China and catch up. In 2022, China exports USD 512.5 billion worth of photovoltaic products (including silicon wafers, cells and components), with an annual increase of over 8%. If we include wind power products, then Chinese manufactured equipment can reduce up to 5.73 billion tons of carbon emissions for importing countries.

CLP and HK Electric should strengthen their ties with institutions in Mainland China to accelerate their use of renewable energy. The government can encourage local certification institutions (e.g. universities, HKQAA, Hong Kong Productivity Council and Science Park) to work with Mainland institutions to establish universal technical standards for Chinese products, thereby promoting Hong Kong's role as an innovation and technology hub and China as a manufacturer of innovative technology.

3.3. Commercialisation Mechanism: Advocate 'climate risk investment' in the financial market, strengthen the financing and risk management ability for electricity companies to participate in carbon-neutral projects

Carbon-neutral businesses may result in a zero-sum game. Business risks may put off many conventional energy companies' interest in carbon-neutral technology. However, with the introduction of 'climate risk investment mechanism', more energy companies may participate in carbon neutrality projects more extensively.

The government can also introduce policies to increase investment in renewable energies and accelerate the elimination of coal-fired power plants before 2035, such as investment facilitation and tax incentives. This will benefit and entice electric companies to develop more carbon-neutral projects including hydrogen production and carbon capture technology (i.e., blue hydrogen technology route).

4. Conclusion

There is a road map for the Hong Kong government and the major electric companies to reduce emissions, but time is short and we are racing against the clock. Effective measures and efficient execution are essential to ensure timely results.

We have summarized six categories of emission reduction policies in our last paper in this series, and in this paper we have proposed the measures of a carbon tax and improvement of commercialization, which fall into the Market Control & Commercialisation mechanisms, two of the six categories of emission reduction policies. We hope these ideas can provoke more stakeholders in Hong Kong to think about more practical measures to translate the net zero carbon aspirations into reality.

Apart from power generation, 'transportation' also accounts for about one-fifth of Hong Kong's total emissions. We will delve into the means to tackle emissions caused by transportation in the next paper.