

Searching for New Directions

A Study of Hong Kong Electricity Market

Consumer Council
4 December 2014



Objectives of the study

Examine whether international experience can offer models for HK, for example by bringing greater competition into the electricity sector

Review proposals for fuel mix policy aimed at achieving environmental objectives, in particular identifying impacts on consumers

Search for models of regulation to replace, or evolve from, the existing Scheme of Control (SoC)

→ Suggest policy directions on electricity regulatory reform which will improve consumer welfare

Methodology

**Conduct research on overseas reform experience in last 30 years
(Aug – Dec 2013)**

- **Australia**
- **Mainland China**
- **European countries, e.g. United Kingdom, Germany and France**

**Seek local views through stakeholder engagement
(Jul – Aug 2013, May 2014)**

- **The Government**
- **Energy companies**
- **Environmental bodies**
- **Academia**
- **Social concern groups**
- **Industry associations**
- **Chambers**

Consumers International (CI) – Expert Group



**Mr. Allan
Asher**

- Chair of the Foundation for Effective Markets and Governance
- Former Chief Executive of Energy Watch
- A barrister and solicitor, and a lifelong campaigner for consumer protection, fairness and equitable development



**Mr. Robin
Simpson**

- Senior policy adviser at CI
- Team member in the UN Guidelines on Consumer Protection
- Working with Korean Standards institute and Consumers Korea to develop ISO standards for customer service in energy



**Professor
Stephen Thomas**

- Professor of Energy Policy and Director of Research in the Business School of the University of Greenwich
- An independent energy policy researcher for 35 years
- Former member of the Energy Policy Programme at Science Policy Research Unit, University of Sussex

Scope of review

Overseas Experience

- Government environment policy
- Competition
- Regulation
- Regulatory models and methodology
- Critical mass of the regulator
- Consumer representation

Market Development of Southern China

- Capacity and production
- Sector reform

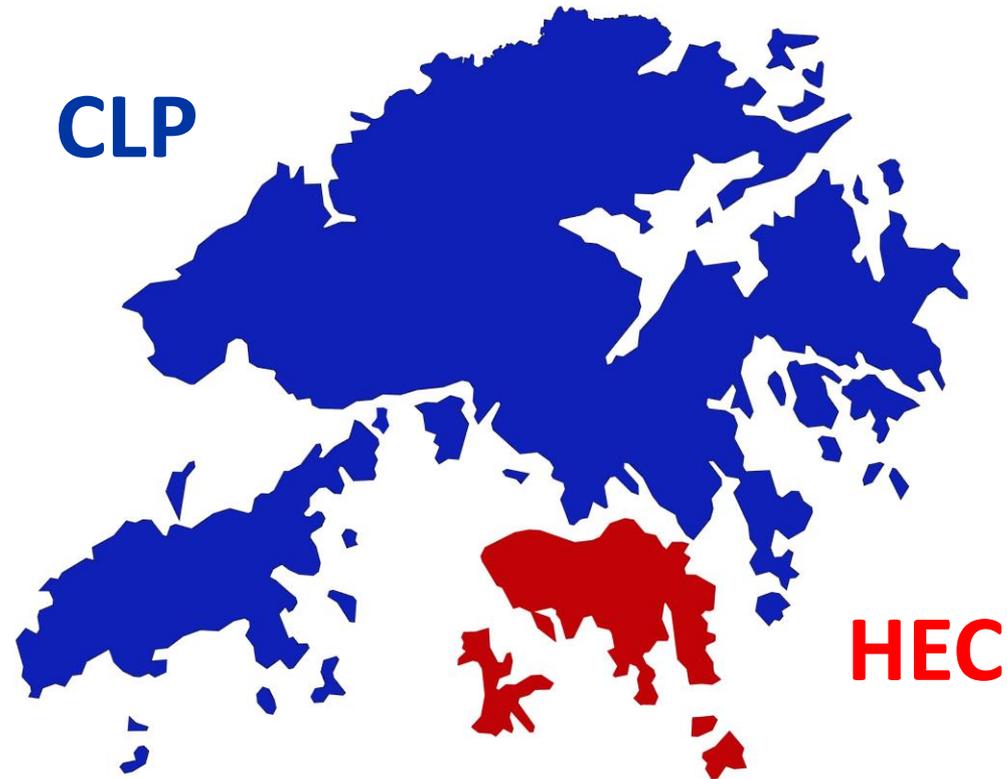
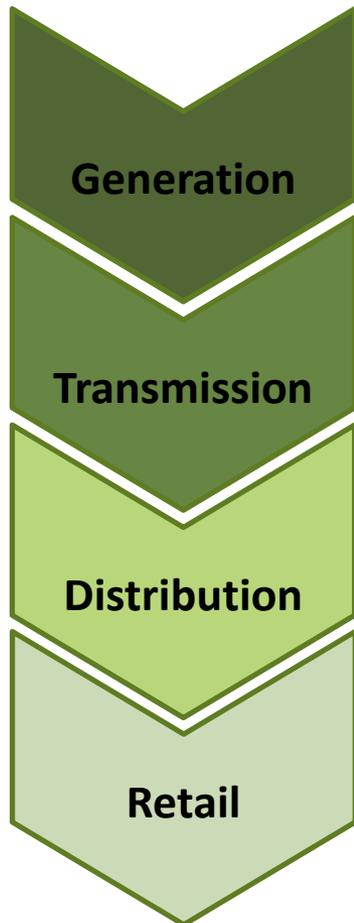
State of Hong Kong Electricity Market

- Current and future energy policy
- Development of renewable energy
- Scheme of Control



Conflicting objectives requiring trade-off

Hong Kong electricity market structure – Two vertically integrated monopolies



Regulatory framework – Scheme of Control Agreements (SCAs)

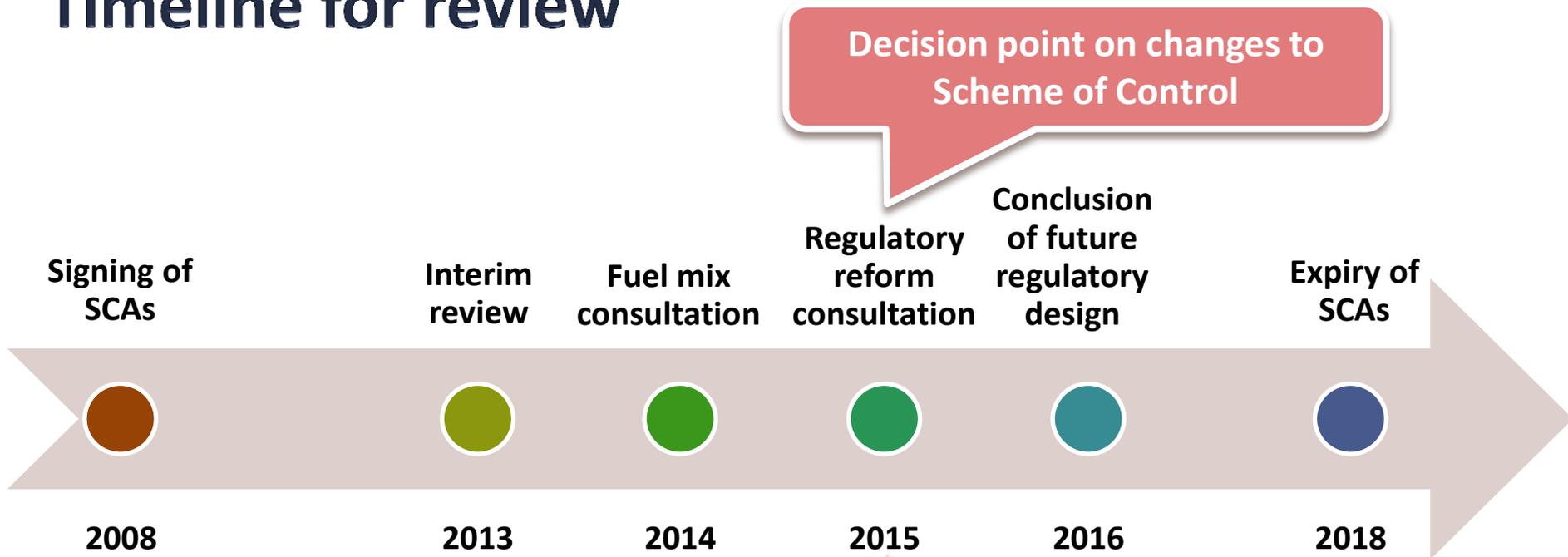
Contractual agreements

- 10-year term (2008-2018)
- Interim review at 5 years
- 9.99% permitted real rate of return (RoR) on the average net fixed assets
- 11% RoR for renewables
- Fuel price increases passed on to consumers via fuel clause charge
- Penalty reduction of 0.2-0.4% RoR for exceeding emission caps

Framework for monitoring the two monopoly power companies:

- Provision of sufficient facilities to meet present and future electricity demand
- Supply of electricity at the lowest possible cost
- Provision for periodic development plan review and annual tariff review
- Annual audit and monitoring of the business, technical and financial performance of the power companies

Timeline for review



Decision point on changes to Scheme of Control

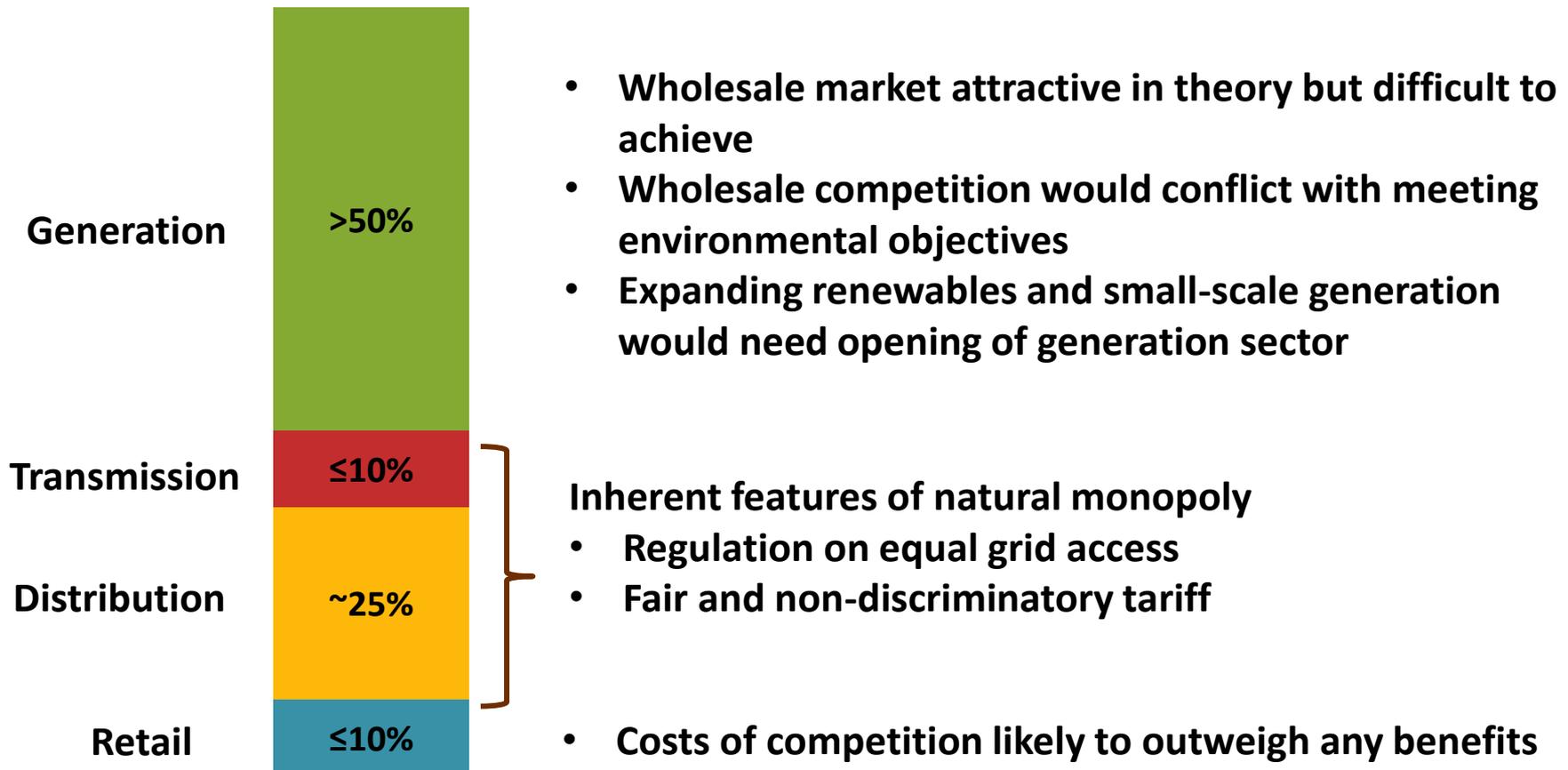
2015 will be a critical year for the community to present their views on the direction for electricity market development

A need for change

SoC	
Now	Future
<ul style="list-style-type: none">• Achieve reliability and affordability• Business risks transfer to consumers• No transparency• No consumer participation• No obligation to expand non-fossil fuel generation	<ul style="list-style-type: none">• Achieve lowest sustainable price consistent with meeting environmental and security goals• Share risks between consumers and producers• Bring transparency to the regulatory regime• Incorporate greater consumer participation• Improve air quality and reduce greenhouse gas emissions

Competition in the electricity sector

Estimated Breakdown of
Consumer Bill



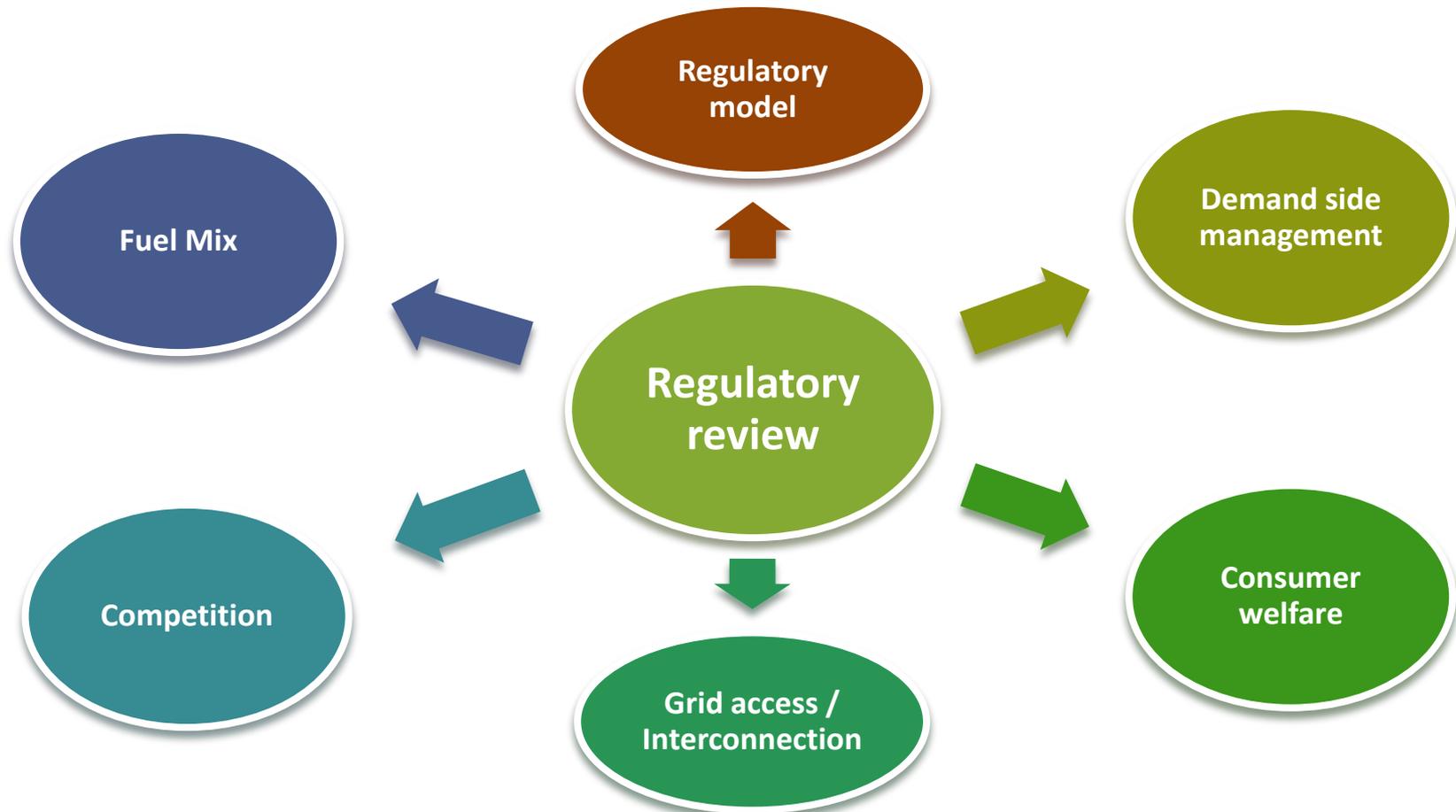
A gradual and progressive reform

Suggestion 1 Ensure the strengths of the existing system are not lost and new objectives are met

Adopt a holistic approach to review the sector, and should not be compartmentalised into discrete issues

Be ware of trade-offs involved in meeting the objectives of reliability, affordability and environmental sustainability

All factors should be considered to reach the right balance



Market liberalisation

Suggestion 2

Overseas experiences indicate that the results of competitive market were commonly disappointing as compared with the theory, due to:

- reconsolidation of market players;
- imbalance in bargaining power; and
- malpractices in selling and high switching costs for consumers

For Hong Kong, a degree of liberalisation of the generation market may open a range of opportunities, for example, access to renewables and natural gas, rather better than a drive for retail competition

UK experience – Reconsolidation of market players



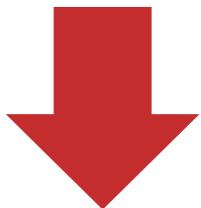
UK experience – Impacts on consumers

Favour commercial
consumers

5%

Residential
consumers

Large
industrial or
commercial
consumers



22%



Imbalance in
bargaining power

UK experience – Impacts on consumers

- **2012 UK Government commissioned report on fuel poverty:
50% of poor households ended up with ‘wrong’ deal**



**Doorstep selling
malpractice**

Australian experience on market reform

Deregulation and privatisation took place in 1990s, introducing generation and retail competition

Formation of national regulator

In recent years, market reconsolidation happened

From traditional 75% coal / 15% gas → Diversification in fuel mix

Aggressive energy efficiency programme to tighten demand

Potential new generation sources

- Wider adoption of natural gas – incumbent or new player
- Renewables – incumbent or new player
- Recycle waste and biomass
- Import from South China grid
- Nuclear option

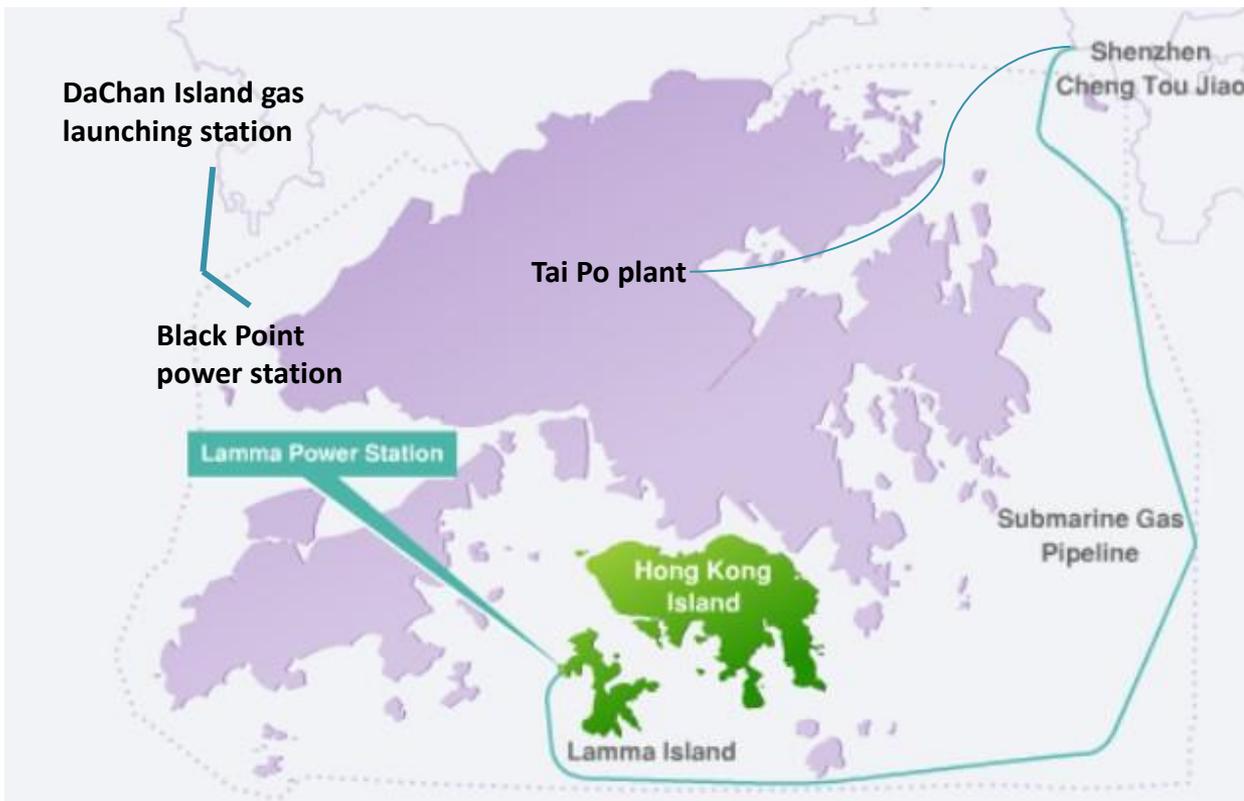
Use of natural gas as power generation

Suggestion 3

In connection with liberalising the market, it is suggested that the Hong Kong Government investigates the feasibility and economic viability of broadening the access of natural gas pipelines for fuelling new small-scale co-generation

The gas-fired plants in Hong Kong which used older technology could upgrade to the latest design of combined cycle gas generation to increase plant efficiencies and to reduce greenhouse gas emissions

Possibility to fuel small-scale co-generation



Revisit EMSD's idea of natural gas based common carrier system in 1997 to enable commercial small-scale co-generation

Hong Kong's gas-fired power plants

- Replacing some gas-fired plants at Lamma and Black Point with current designs would be economically attractive as well as reducing emissions of greenhouse gases

Plant	Owner	Output (MW)	Year of Commissioning
Black Point	CLP	8 x 312	1996-2006
Lamma Extension 1	HEC	1 x 345	2002
Lamma Extension 2	HEC	1 x 335	2006

Note: Lamma Extension 1 comprises two gas turbines, each of 125 MW, that were converted to combined cycle operation by the addition of a single waste heat boiler.

- Natural gas is an ideal co-generation fuel because it does not require user storage and because of its cleanliness in use

Use of renewables

Suggestion 4 Enabling measures should be taken to test the scope and cost of renewables

This will determine whether there is scope for a large renewables contribution to Hong Kong's electricity mix and will allow, if needed, an efficient local supply industry to emerge

Experience from overseas markets often indicates more scope for renewables and at lower cost than initially anticipated, so the potential for Hong Kong should be further explored

Air-borne Emissions from the Coal and Gas-fired Power Stations

Particulates, acid gases particularly SO_x and NO_x

- Electrostatic precipitators (ESP)
- Flue gas desulphurisation (FGD)
- Low- NO_x burners

Greenhouse gases, especially CO_2

- No commercially viable way of capturing CO_2 emissions
- Move to forms of generation (e.g. renewables, nuclear) that reduce the greenhouse gas emissions

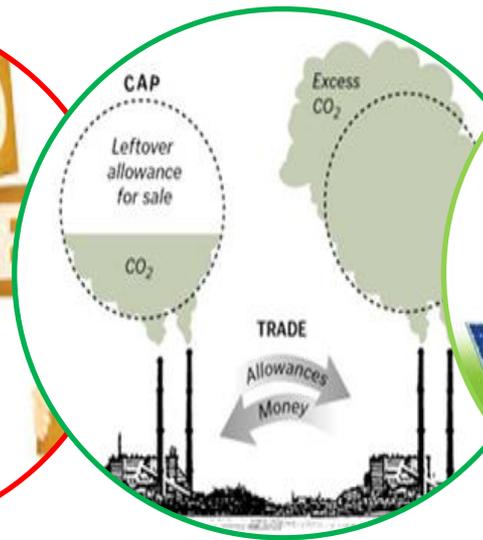
Market-based measures induce renewables

Capacity
auctions

Renewable
obligations



Feed-in
tariffs



Emissions
trading



Overseas experience

- A difficult start – gradual public realisation due to higher prices to begin
- Government policy is needed to reduce exposure of the asset to the market
- If opportunities offered, the outcome is far better than forecast
- Downward trend on cost for renewables as new technology emerges

Opportunities for Hong Kong



Solar



Wind

Case of Germany

Feed-in Law passed in 1990

- Buy the electricity produced at a rate of 65-90% of the average tariff charged per unit to users, leading to expansion of wind power

Renewable Energy Sources Act passed in 2000

- Replaced the percentage-based pricing with a fixed rate and guaranteed purchase of the power for around 20 years
- Different rates for different technologies
- Included a target of a 12.5% market share by 2010 and 20% by 2020

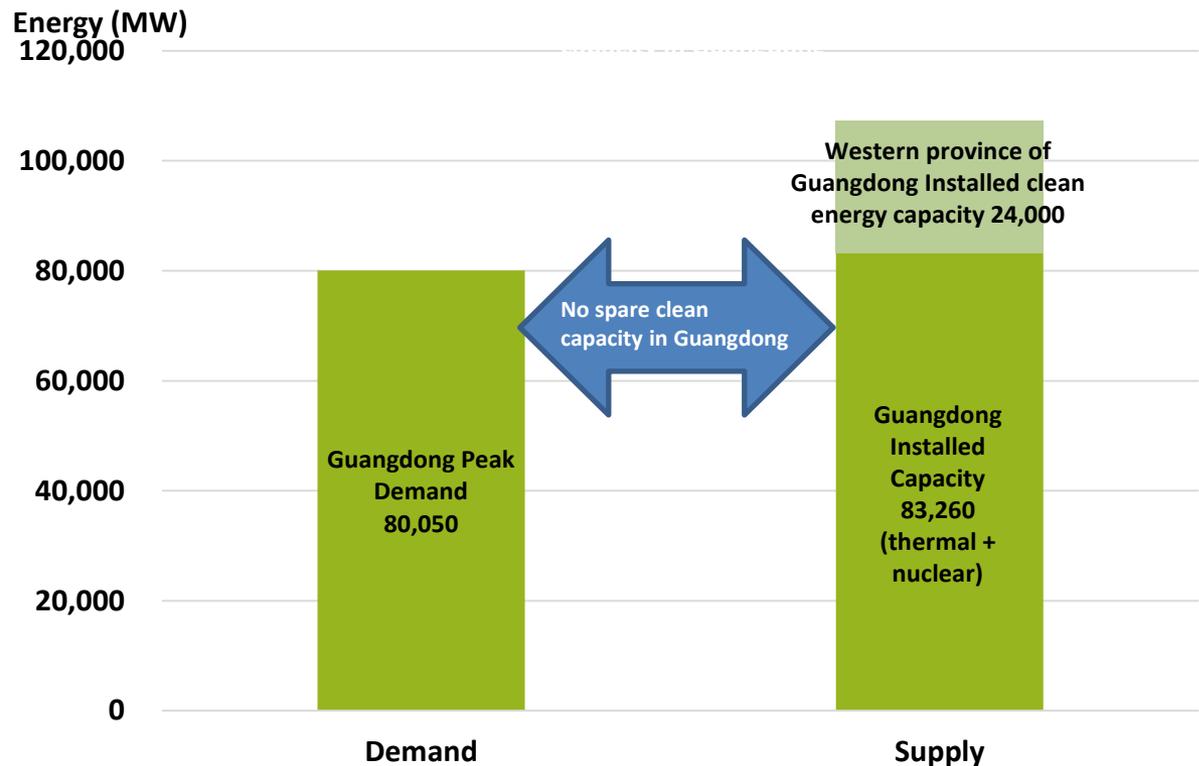
Other options

Suggestion 5 Strong national policy and inter-governmental collaboration may clear the uncertainties from importing affordable and clean electricity from Mainland China

The potential advantages from newly planned nuclear energy are far from clear in price terms given the uncertainties around the evolving technology

Demand versus supply in Guangdong

- Guangdong does not have sufficient clean energy and nuclear energy capacity to meet its clean energy demand.
- Electricity generated for export to Hong Kong probably from fossil fuel.



Nuclear option



Output from two Daya Bay nuclear plants around 30% of the CLP supply to Hong Kong

Escalating costs of safety will lead to price increases

Nuclear plant under construction in Finland is currently 250% over-budget and 9 years late

Energy efficiency

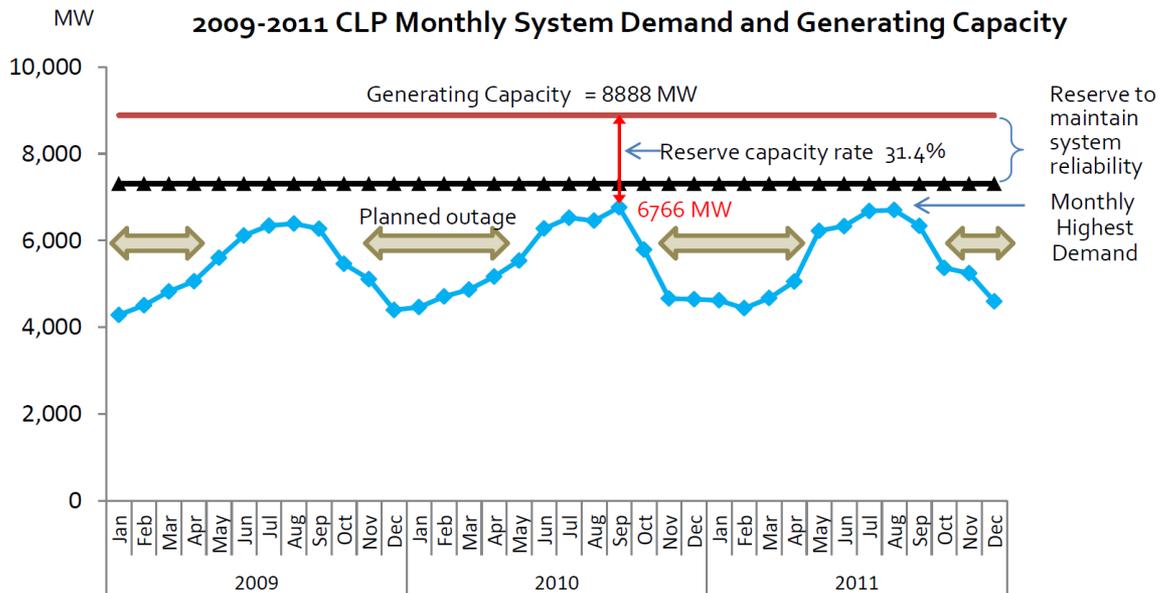
Suggestion 6

A much stronger energy efficiency effort is likely to be a 'no-regrets' policy providing reduced environmental impacts and improving affordability

This may well also improve security of supply and uphold the existing standards as a result of reducing demand, especially at peak times

Peak load data of Hong Kong

- **Plant margin: amount of capacity kept in operation over and above the maximum demand in order to cover for plant breakdowns and unexpected demand surge**
- **Plant margin: 40-45% serve peak load demand in 2014**
- **No measureable impact on supply security even ↓ 25%**



Source: Information Paper of CLP to Legislative Council

Motivating consumers for energy efficiency

- Incentive programme to benefit directly at individual household level
- Demotivation exists for multi-occupied households as no benefit yield

Demand side management

- Behavioural adaptation
- Demand shifting through time
- Reduce air-conditioning intensity
- Time-of-use pricing may not be efficient due to high cost to consumers

Energy Efficiency

- Raise the band for top energy efficiency
- Introduce more appliances into the scheme
- Case of UK
 - Estimated by 2020 savings from adopting EU-wide standards and energy labels amount to £850 million, reduce greenhouse gas emissions by 7 million tonnes per year



ENERGY LABEL 能源標籤	
Brand 牌子	ABC 某某牌
Model 型號	HK1234
Annual Energy Consumption * kWh/y 每年耗電量	364
Energy Efficiency Grade* 能源效率級別	2
Washing Machine Category* 洗衣機類別	1
Washing Capacity (kg) 洗衣量 (公斤)	5
Water Consumption (litres) 耗水量 (公升)	22
EU Registration Number 能源標籤登記號碼	W 99-0001

* The data are provided according to the Hong Kong Energy Efficiency Labelling Scheme. An Energy Efficiency Label is provided by the Electrical and Mechanical Services Department (EMSD), Government of the Hong Kong Special Administrative Region. The registration label can be found at its EMSD website or www.emeed.gov.hk.

資料來源: 香港特別行政區政府電機工程署
註冊能源標籤號碼: 99-0001
電機工程署 EMSD

Regulatory development

- Suggestion 7** The regulatory system needs to be opened up to greater public participation and significantly strengthened so it can meet the demands and expectations that a reformed Hong Kong electricity sector would stimulate
-

Common regulatory models identified by Eberhard

Regulation by government, especially where a state owned enterprise is the direct provider

Independent regulation in an autonomous public institution (as is the intention in the UK and US)

Outsourced regulation to third parties, e.g. tariff reviews, benchmarking, dispute resolution

Regulation by contract (as in France, or elsewhere in countries using the Francophone legal tradition, or where French contractors are able to offer such agreements)

Regulatory methodology

- **Common means for regulating natural monopoly**
 - Elaborate mix of asset valuation, demand projections, rewards for operating efficiencies, and penalties and incentives
 - UK – price cap in 1990s (RPI-X as the target percentage efficiency improvement), change to RoR in 1995
 - US – RoR (cost plus approach, no gold plating of unnecessary assets)

The Future

- Transparency of corporate information and regulatory analysis
- Fair balance of interests between producers and consumers
- Monopoly suppliers do not exploit their positions

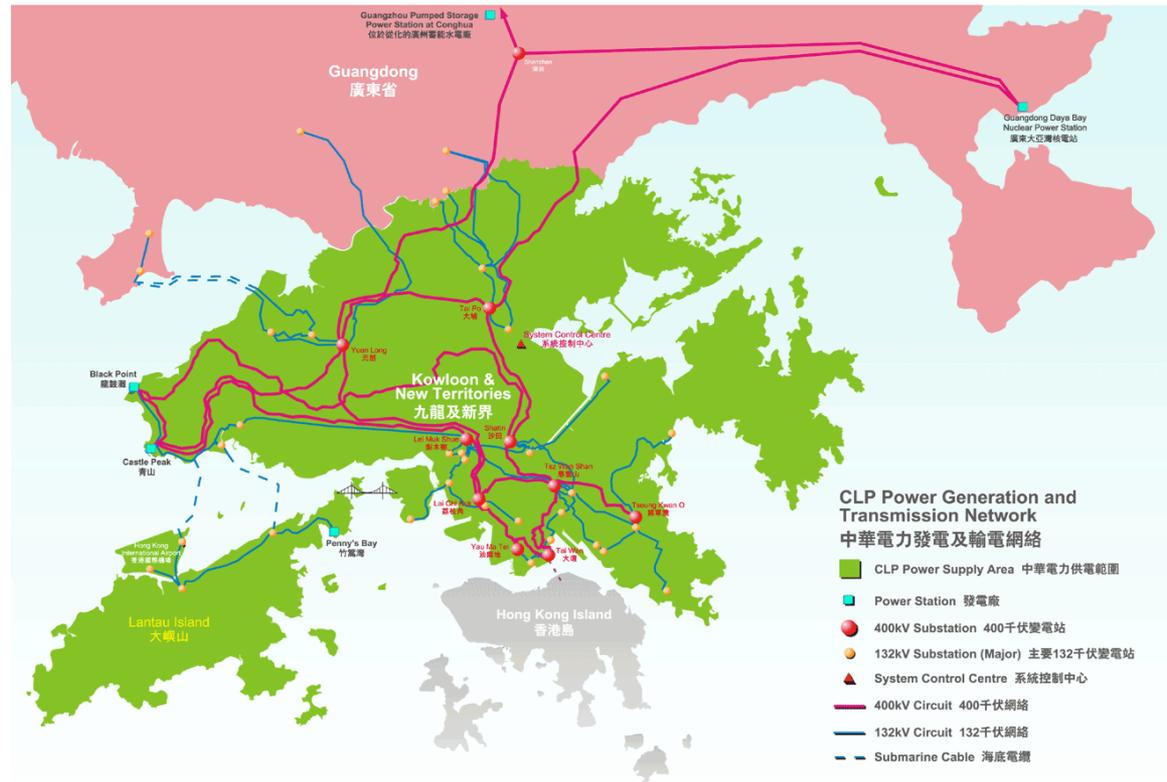
Access to networks – a critical enabler

Suggestion 8

Control of the network should be reviewed to ensure that new generators are able to access the network on the same terms as the incumbents

The cost-effectiveness of a further interconnector between the two systems for Hong Kong should be investigated as a contribution both to greater efficiency and to introducing new generation market entrants

Interconnections



The transmission system of CLP

Source: Physics World website

A cross harbour AC (alternating current) link with a capacity of 720 MVA to provide emergency support

Protection for low-income consumers

Suggestion 9

As the energy cost is expected to rise, a holistic approach in reviewing the current protection for low-income consumers is necessary to ensure that they can afford the power they need to protect their well-being

There is also an urgent need to quantify and locate the extent of 'fuel poverty' in Hong Kong, and to identify gaps in the current approaches (reliance on rising block tariffs and social security benefits) and to formulate mitigation measures such as energy efficiency programmes targeted at low-income consumers to bring them electricity services at lowest cost

Address fuel poverty



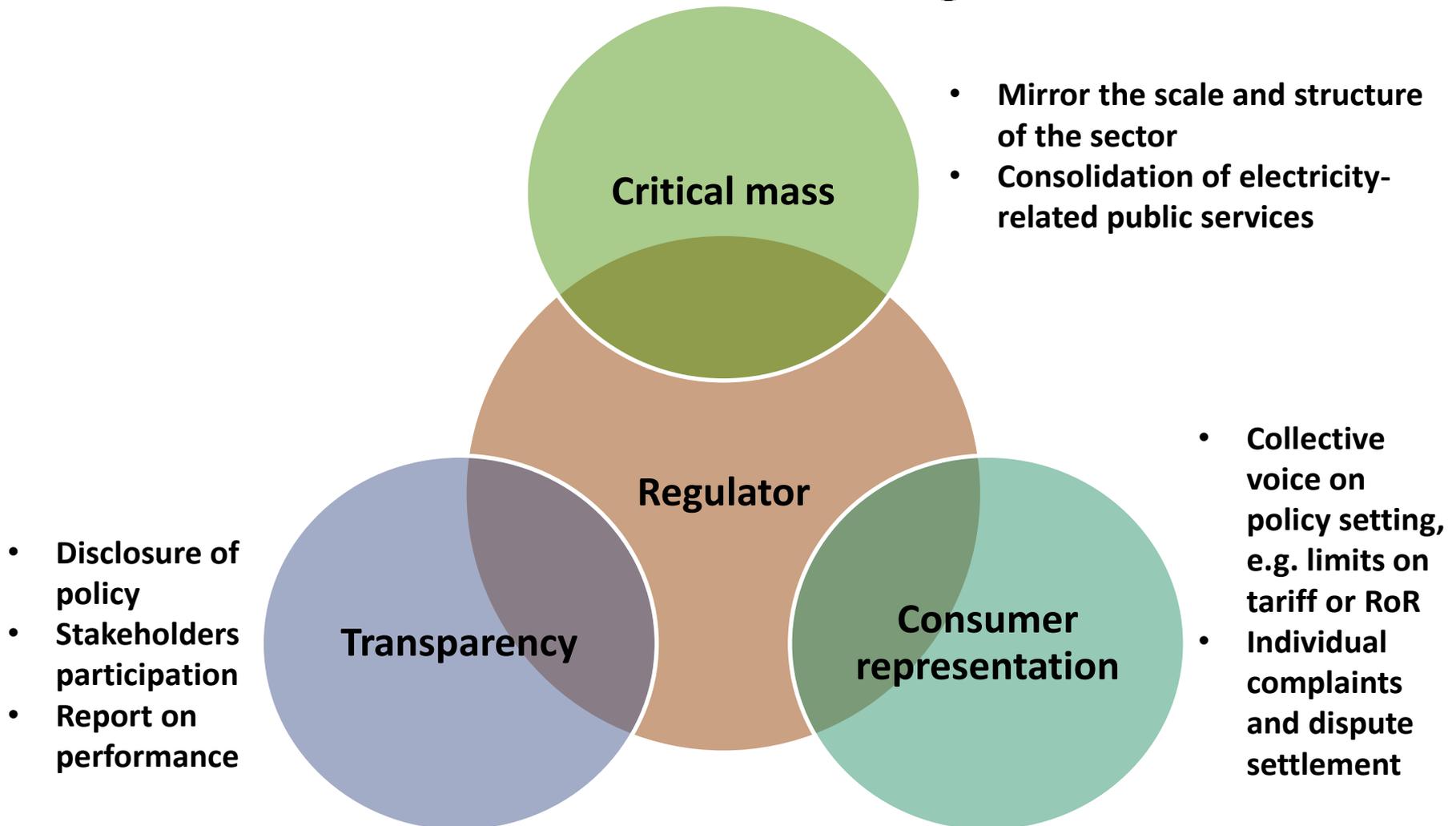
An urgent need to quantify and locate the extent of 'fuel poverty'

The regulatory body

Suggestion 10

For proper planning and implementation of the long-term regulatory reform of the electricity sector in Hong Kong, it is of top priority for the Hong Kong Government to establish a full-fledged energy sector regulator which needs to have the ‘critical mass’ to perform in relation to the structure and size of the industry

Characteristics of an efficient regulator



A call for a strategic and holistic review

A range of works ahead

A feasibility study to explore economic viability of the wider access of natural gas pipelines for fuelling new small-scale co-generation

An assessment to explore the potential of renewable energy and its scope and cost

Evaluate the feasibility of dedicated clean energy source for import electricity from Mainland China

A call for a strategic and holistic review (cont'd)

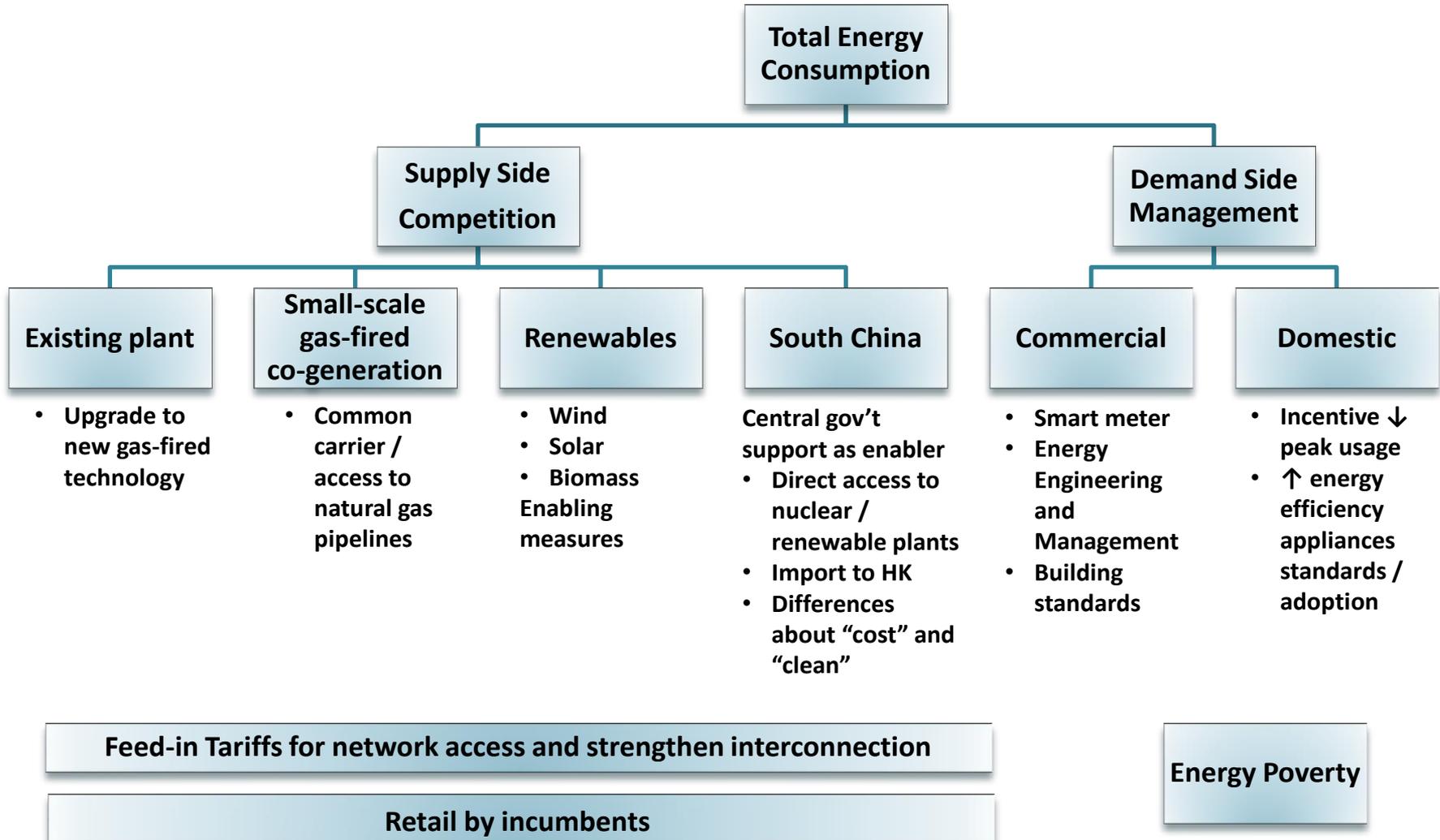
A range of works ahead

A review on the control of the network to ensure that new generators, including greater use of renewables, are able to access the network on the same terms as the incumbents

An investigation into the cost effectiveness of a stronger interconnection between the present two systems to allow optimization of the generation mix across both systems

An in-depth research to quantify and locate the extent of fuel poverty at foreseeable electricity costs in 5 years time

A snapshot view of suggestions



Collaborative efforts from
the society to develop **a new**
electricity regulatory
framework for the
betterment of consumer
welfare

