



香港電燈有限公司
The Hongkong Electric Co., Ltd.



Prospect of Renewable Energy in Hong Kong

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**Seminar on “*Renewable Energy in Hong Kong*”
Hong Kong Energy Studies Centre, Hong Kong Baptist University**



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Renewable Energy Worldwide

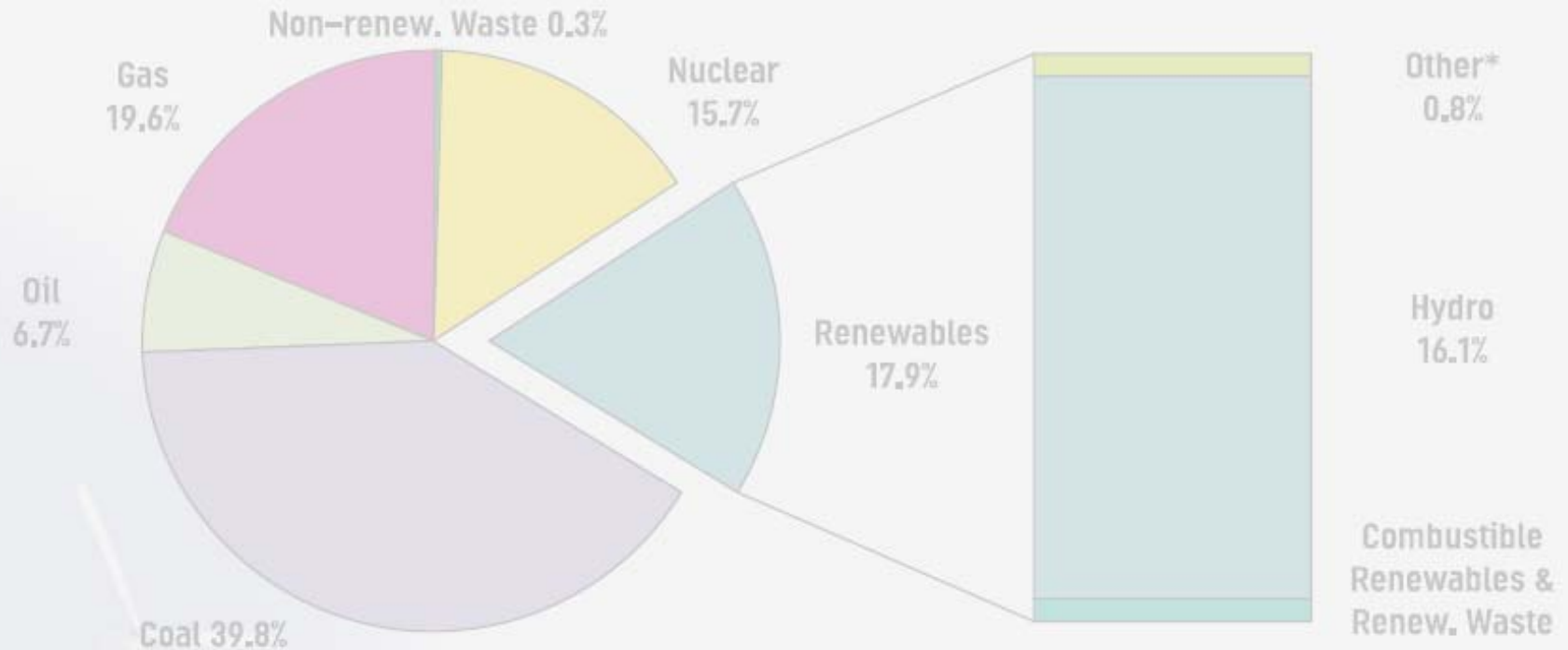


Renewable Energy Today

- Drivers for renewable energy
 - reducing fuel security
 - soaring fuel prices
 - worsening environment
- For global electricity generation in 2004, RE accounts for 17.9% out of which hydro accounts for 16.1%
- In terms of primary energy, RE (excluding hydro, biomass & waste) accounts for 0.5% (57Mtoe out of 11,204Mtoe in 2004)



2004 Renewables in Electricity Production



* Geothermal, solar, wind, tide/wave/ocean.

Source: IEA Energy Statistics



Global Wind Power Capacity in 2005

Country	Installed Capacity (MW)
Germany	18,450
Spain	10,030
USA	9,180
India	4,250
Denmark	3,090

Country	Installed Capacity (MW)
Italy	1,710
UK	1,340
China	1,260
Netherland	1,220
Japan	1,160



Renewable Energy in 2030

- World electricity generation almost doubles from 17,408TWh in 2004 to 33,750TWh in 2030
- Hydro power though increases by 2% p.a. its share in electricity generation decreases from 16% to 14%
- Non-hydro RE in electricity generation increases from 2% to 7%
- In terms of primary energy, RE totally accounts for 13.7% (2,349Mtoe out of 17,095Mtoe)
- Other RE (wind, solar, geothermal, etc.) accounts for 1.73%



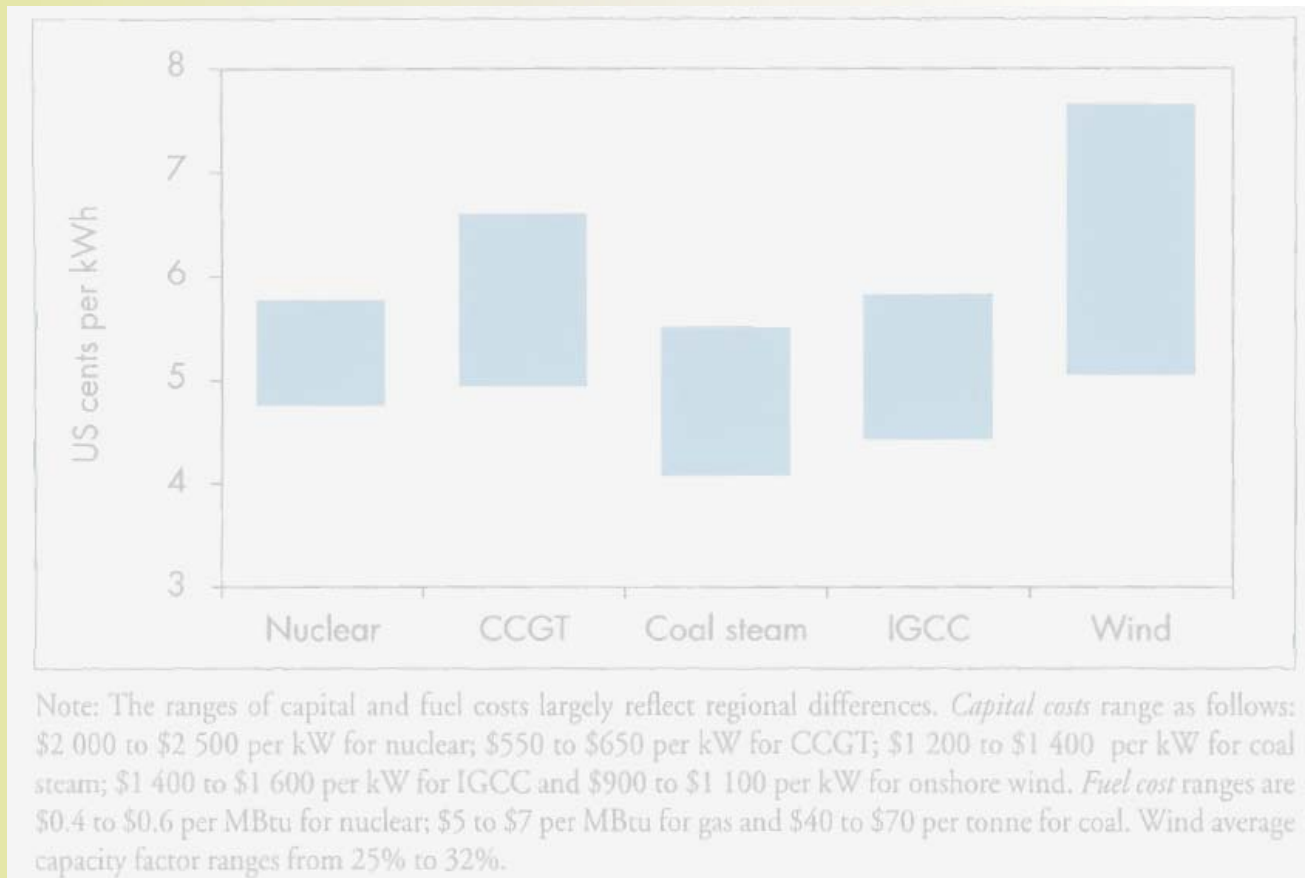
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Generating Costs of Different Technologies

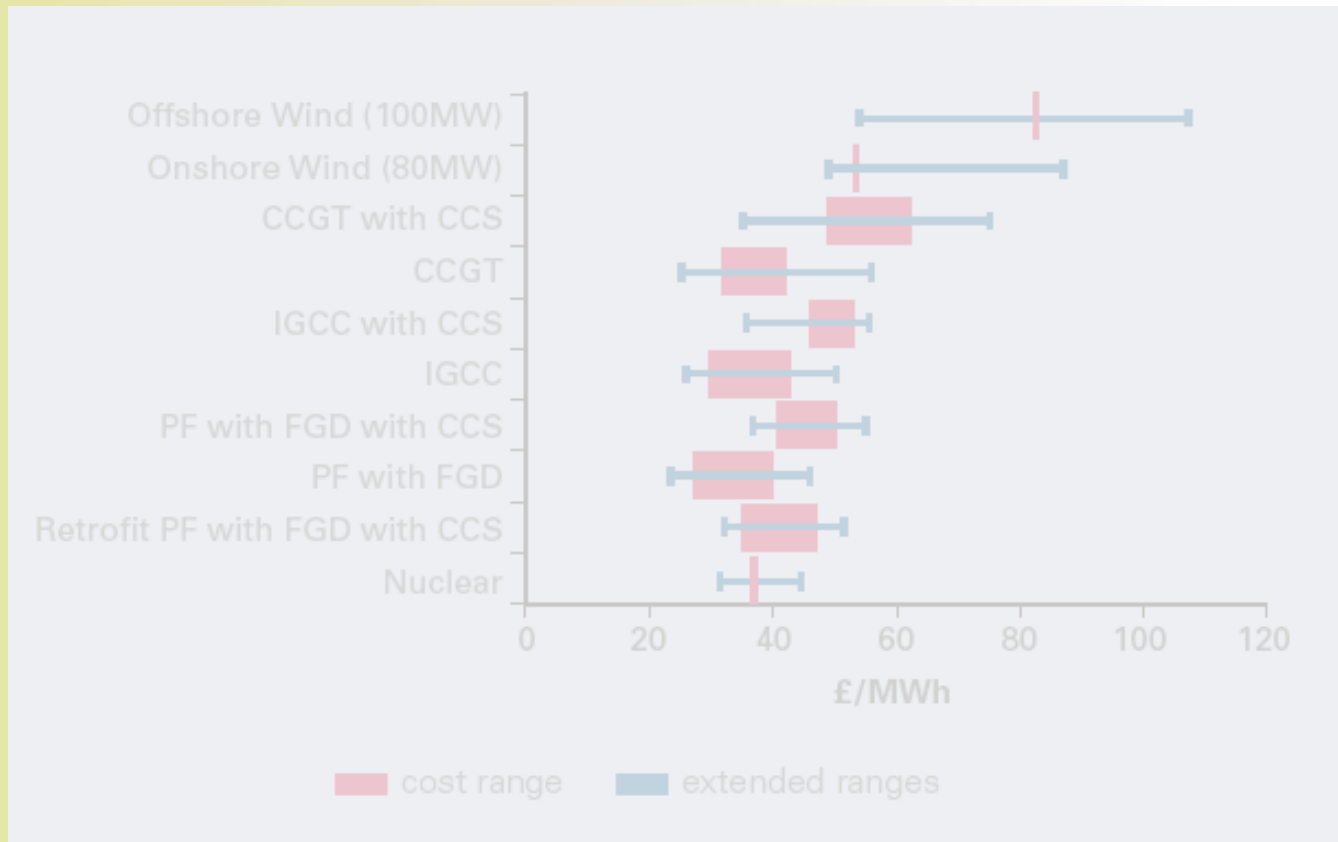


Electricity Generating Cost Ranges of Baseload Technologies





Electricity Generating Costs of Different Technologies



Source : The Energy Challenge, July 2006, Department of Trade & Industry, UK



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Renewable Energy in China



Renewable Energy Law

- Effective from 1st January 2006
- The law clarifies responsibilities and obligations in the overall society and provides legal basis for the renewable energy development



Renewable Energy Development in China

- Share of RE in electricity generation
 - 2010 target : 10%
 - 2020 target : 16%
 - RE Capacity Target by 2020
 - Hydro (300,000 MW)
 - Wind (30,000 MW)
 - Biomass (30,000 MW)
 - Solar (1,800 MW)



China Wind Power Capacity in 2005

	Cumulative Generating Units	Installed Capacity (MW)
Xinjiang	296	181.41
Inner Mongolia	260	165.74
Guangdong	271	140.54
Liaoning	203	127.46
Shandong	100	83.85
Shanghai	18	24.40
Hainan	18	8.7
Hong Kong	1	0.8



Challenges for China Wind Projects

- High capital cost per MW : RMB9,000 vs RMB4,500 for coal
- True cost of RE cannot be fully reflected
- Grid connection & Reliability issues
- Lack of indigenous technology for MW size unit



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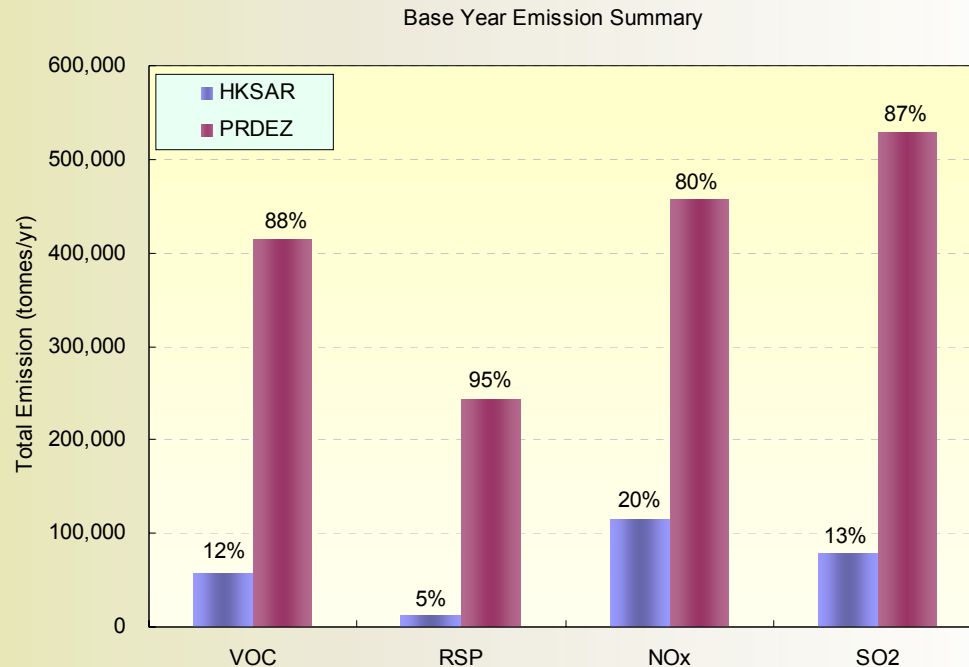


Environmental Issues in Hong Kong



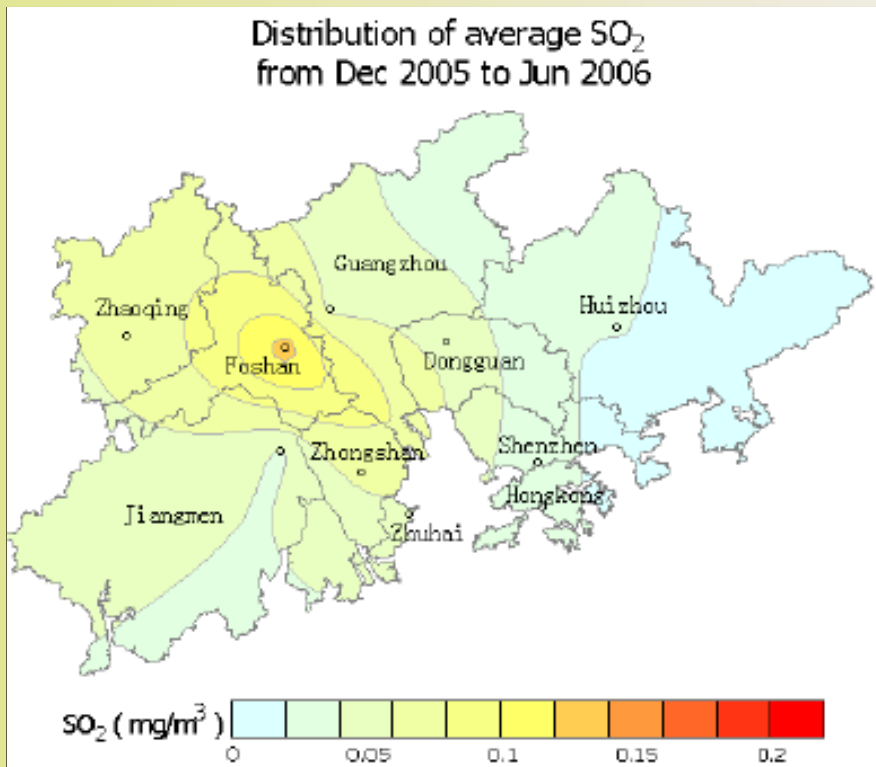
Sharing of Emissions in 2002

- “*Study of Air Quality in the Pearl River Delta Region, 2002*” tries to analyze contributions of pollutant emissions from Hong Kong and Pearl River Delta





Actual SO₂ Emissions in 2005/2006

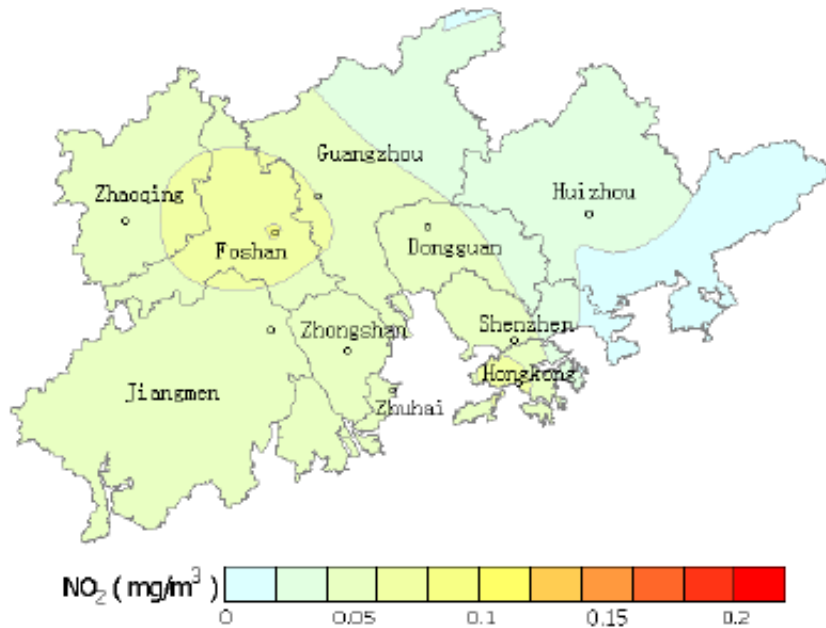


- Source: “PRD Regional Air Monitoring Network - A report of monitoring results for the period between December 2005 and June 2006”

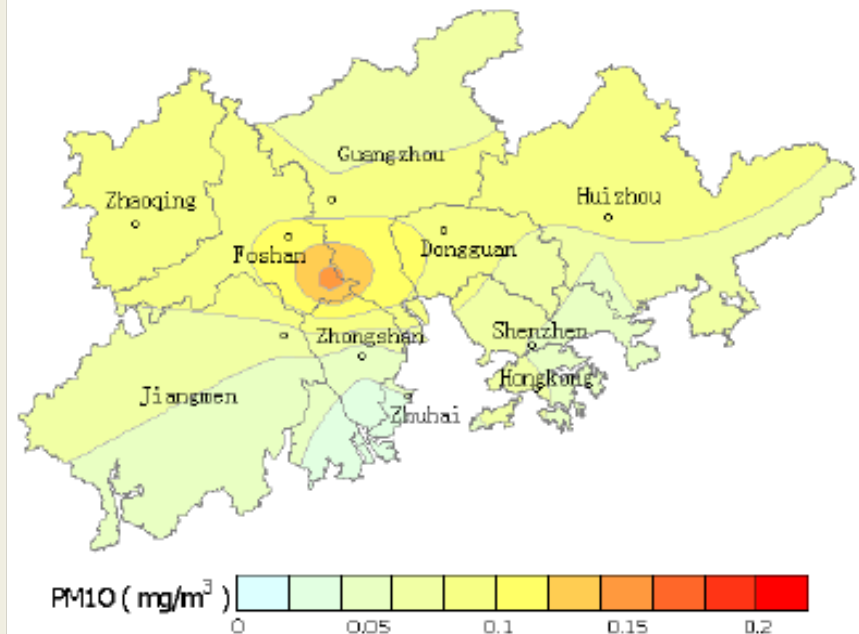


Actual NO_x & RSP Emissions in 2005/2006

Distribution of average NO₂
from Dec 2005 to Jun 2006



Distribution of average PM10
from Dec 2005 to Jun 2006





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Renewable Energy in Hong Kong



Government's Initiatives

- “*Study on the Potential Applications of Renewable Energy in Hong Kong, 2002*” explores 4 potential RE technologies :-
 - Fuel cells
 - Photovoltaic systems
 - Energy-from-waste
 - Wind power
- Wind power, solar power and energy-from-waste are considered viable
- In 2005 the *First Sustainable Development Strategy* sets a target of 1~2% RE in electricity use by 2012



Photovoltaic (PV)

- High material and installation cost
- Geographic constraint on PV applications
 - Orientation of PV greatly affects solar radiation absorption efficiency
 - Open space for large scale installation
- Can be used as distributed generation for local use



Energy-from-waste

- Landfill gas utilization
 - Landfill gas is limited
 - Small generation capacity
- Heat recovery from waste combustion
 - Public concern on emission
 - Capacity limited by solid waste available
- Energy-from-waste has double benefits
 - Mitigate solid waste problem
 - Produce RE
- Viable RE resources and mature technologies



Wind Power

- Technology is mature
- Wind resources are site specific
- On-shore wind farms require large open space that Hong Kong lacks
- Off-shore wind farms may be possible but much more expensive
- Most promising RE technology for sizeable development



HEC's Initiatives

- HEC has taken proactive steps in exploring RE potential in Hong Kong
 - Commissioned first commercial scale wind turbine, *Lamma Winds*, in February 2006
 - Expand use of PV and solar heating in various premises
 - Explore feasibility of developing a 100MW offshore wind farm in Hong Kong waters



Experience from *Lamma Winds*

- Low Capacity Factor & High Costs
 - *Lamma Winds*' capacity rate = ~13%
 - Commercial windfarms operate at 25-32% capacity factor
 - Per kW cost is high : HK\$15,000 at Lamma vs US\$1,000 overseas
 - Levelized cost is more than 3 times overseas commercial windfarms
- Intermittent and Uncontrollable Operations
 - highest generation in a day : >13,000kWh
 - lowest generation in a day : Zero kWh
 - greatest no. of cut-in & cut-out in a day : >50 times



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Going Forward



Going Forward

- RE is playing an increasing role in worldwide and China markets
- HEC is actively pursuing RE projects in Hong Kong and overseas
- Due to geographic constraints there are considerable challenges for power companies to develop sizeable RE facilities in Hong Kong
- HEC is exploring feasibility of developing 100MW off-shore windfarm in Hong Kong waters
- HEC is willing to assist HKSAR Government to deliver the RE target of 1-2% by 2012



Thank You