

Submission from	Received on
1. The Conservancy Association	08/04/2003
2. Citizens Party	07/04/2003
3. Friends of the Earth (HK)	06/04/2003
4. 李肇峰先生	06/04/2003
5. Mr. Edward Lo	06/04/2003
6. The HK Federation of E&M Contractors Limited	06/04/2003
7. Civic Exchange	05/04/2003
8. Ove Arup & Partners Hong Kong Ltd	05/04/2003
9. Institute of Energy (HK Branch)	05/04/2003
10. ASHRAE Hong Kong Chapter (2002-03)	05/04/2003
11. The Hongkong Electric	04/04/2003
12. CLP Power	04/04/2003
13. The HK PV Consortium	04/04/2003
14. Greenpeace	04/04/2003
15. Blurmax	04/04/2003
16. Marubeni	04/04/2003
17. Mr. Don Latter	03/04/2003
18. Mr. Samuel Chan	03/04/2003
19. The Hong Kong Institution of Engineers	03/04/2003
20. Shell Solar Pte Ltd	31/03/2003
21. 民主黨	28/03/2003
22. Environmental Resources Management	07/03/2003
23. Mr Kim Salkeld	07/03/2003
24. Ms Josie Close	06/03/2003
25. Cheung Kong Infrastructure Holdings Ltd	06/03/2003
26. 楊亨利先生	02/03/2003
27. Air and Waste Management Association Hong Kong Section	06/04/2003
28. Rankine & Hill (Hong Kong) Ltd	05/04/2003



長春社

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8 April 2003

Lai Sze-hoi, Roger
Director of Electrical & Mechanical Services
Electrical and Mechanical Services Department
98 Caroline Hill Road,
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Urgent by Fax (28906081) and Mail
28826469

Dear Mr Lai

Study on the Potential Applications of Renewable Energy in Hong Kong Stage 1 Study Report

Thank you for your letter dated 21 March 2003 inviting the Association to comment on the captioned Study. We are sorry for not able to send you our comments earlier due to tight resources. I hope that our views stated in the following will still be considered by your department.

The Association is pleased that the government has commissioned the Study on the Potential Applications of Renewable Energy in Hong Kong (the Study). We believe that Hong Kong should take an proactive role in the sustainable use of energy, in line with major developed economies and cities, and thus should adopt a sustainable energy policy as early as possible. A key step towards a sustainable development energy policy is no doubt to identify the potential renewable energy applications in Hong Kong and set a target for Hong Kong's renewable energy contribution to the total energy and electricity consumption. We are pleased that the Study attempted to direct Hong Kong to move in the right direction in this regard. Having reviewed the Study's report, we have the following comments for your consideration.

Renewable energy targets

Firstly in the section on recommendations, the Association is quite disappointed that the Study proposed to set the targets of local renewable energy contribution to electricity demand (against baseline year of 1999) of 1%,

2% and 3% for 2012, 2017 and 2022 respectively. The proposed targets are far lower than those adopted by developed economies and cities.

Take for an example, the European Commission (EC) in its White Paper for a Community Strategy produced in 1997 (and also Green paper in 2001), which is also known to this Study, has targeted to double the share of renewable energies in gross domestic energy consumption in the European Union by 2010 (from the present 6% to 12%). In another paper Renewable Electricity Directive prepared in 2001 EC has also targeted to increase the share of electricity from renewable energies from 14 % to 22 % of gross electricity consumption by 2010.

Hong Kong, as a major world city, should not fall far behind international norms. The Association believes that Hong Kong should not take a too narrow mindset and set such a low target as proposed in the Study. We propose that Hong Kong Government should follow the European Commission targets and set to increase renewable energy contribution to gross electricity demand to 20% by 2010. It should also set the renewable energy share of the total energy consumption to 10%.

Costing

The Association would like to query the costing method of each renewable energy option in the Study. The accounting of cost of each option is not clearly explained and thus the Association cannot make a fair judgment on the cost comparison in the Study. The Association wishes to know if the costing has also included different scenarios such as wide application of each technology (which might lower the unit cost of the energy) and connection of the grid. Most importantly, the Association proposes that externality costs, such as carbon dioxide emissions should be included in the cost estimation.

We note that the unit cost of renewable energy, such as that in the solar energy demonstration project, is heavily influenced by the economy of scale and the level of integration into building structures. Hence it is essential for a full cost comparison be conducted for a project of sufficiently large scale and for projects where renewable energy use is integrated into the building process. This will make renewable energy use more cost-effective especially if clear guidelines can be issued to the construction industry to encourage its

widespread use.

Energy from Waste

The Association is astonished that the Study has included energy-from-waste as an option of renewable energy. The term renewable energy generally refers to energy sources that are inexhaustible compared to conventional fuel. Waste can hardly be regarded as inexhaustible if we agree to the sustainable development principles and that waste avoidance and minimization should be pursued, eventually achieving zero or near zero waste in the long term. Also, there are still heated debates whether co-combustion of Municipal Solid Waste (MSW) should take place in Hong Kong given the current situation that the waste reduction and recycling programs are not carried out satisfactorily. The waste hierarchy stipulated in the Waste Reduction Framework Plan published in 1998 has clearly indicated that waste minimization and avoidance is the most preferred option of waste management.

Although the Association has an open mind to the consideration of energy from waste technology, it objects to putting it as one of the renewable energy options.

Unclear Recommendations

The Association is not satisfied with the Study that its recommendations are relatively general and board-brushed. It has failed to deliver a concrete strategy and action plan for the Government's consideration. It therefore in turn affects its own estimation of the targets proposed in the Study (see above).

The Association would appreciate putting the above comments into your consultation record.

Yours sincerely



Gordon Ng
Chief Executive

From: SEEEB3@emsd.gov.hk
Sent: 08 April 2003 08:21
To: james.chan@cdm.com.hk
Subject: Citizens Party supports wind energy development

----- Àà§e`Ì SEEEB3/LR/EMSD ©ó 08/04/2003 08:30 -----

CEEEA
07/04/2003
18:39
energy

|¬¥óóH;G SEEEB3/LR/EMSD@EMSD
°Æ¥»§Û°e;G
¥D|®;G Citizens Party supports wind
development

----- Forwarded by CEEEA/LR/EMSD on 07/04/2003 18:50 -----

ACOR&D
07/04/2003
18:09
wind energy

To: CEEEA/LR/EMSD@EMSD
cc:
Subject: Citizens Party supports
development

The following e-mail has been acknowledged and is referred to you for necessary action. Please let me have a copy of your reply for record purpose.

ACO/R&D/GR

----- Àà§e`Ì ACOR&D/HQ/EMSD ©ó 2003/04/07 06:03 PM -----

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development

April 6, 2003

Mr. Roger Lai Sze-hoi
Director of Electrical and Mechanical Services
Electrical & Mechanical Services Department

The Government of Hong Kong Special Administrative Region

Dear Mr. LAI:

I am responding to the "Executive Summary on the Stage 1 Study on the Potential Application of Renewable Energy in Hong Kong" published by your Department in December 2002. (This letter will also be posted to Citizens Party's website, <http://www.citizensparty.org>).

The Citizens Party vouches its support for developing renewable energy, especially wind energy, as popular electricity supply in Hong Kong. As recognized in your report, the Hong Kong SAR Government bears the responsibility to establish the necessary market condition for the development of wind energy: in particular grid access by independent power producers (IPPs) and availability of import from Mainland China. Still, we believe that your proposed targets for local renewable energy sources, i.e. less than 2% by 2012 to 4.32% by 2022, are far too modest. In that respect, we support the call from Friends of the Earth (FoE) for a minimum of 5% renewable energy be mandated in Hong Kong's energy mix as soon as the non-technical market barriers are removed. The upcoming interim review of the schemes of control (SoC) in 2003 with the two electricity utilities will provide us with a critical opportunity to pave the way for implementing such target upon the expiration of the current SoC in 2008.

The cause for developing wind energy is clear: to help improve air quality both locally and regionally in the Pearl River Delta. In addition, we need to live up to our global commitment to reducing green house gas emissions (GHG) and helping to contain climate change. According to data provided in a FoE report, coal-fired power generation of the two utilities emits 18.6 million tons of carbon dioxide CO₂ in 2001, rough 50% of the Hong Kong's total CO₂ emissions - the largest component of GHG. In addition, a Civic Exchange report also points out that 49% of nitrogen oxides NO_x and 39% of respirable suspended particulates (RSP) in 1999 was generated from power stations. SO_x, NO_x & RSP are the air pollutants that pose great threats to our individual and public health. On the other hand, a 5% of local energy in renewable energy will result in a 14% reduction in SO₂, 13% reduction in both NO_x and particulates and a 5% reduction in CO₂ emission.

Your study confirms the commercial viability of wind energy with a price ranging from HK\$0.20/kWh to \$0.35/kWh, as compared to the price range of conventional fossil fuel power from \$0.20/kWh to \$0.40/kWh. Government's imposition of a fixed percentage of renewal energy conforms to the international trend. According to the FoE report, Korea sets a target of 2% by 2006, Australia: 11% by 2010, the European Union: 12% by 2010, the UK: from 5% in 2003 to 10% by 2010, Denmark: 20% by 2003, and so on. In China, the Central Government voices its commitment to renewal energy back in 1995, with a project to install 190MW wind farms and 10 MW photovoltaic system from 1999 to 2004, of which 20MW of wind turbines will be installed

in Shanghai. The external environment is appropriate for us to develop wind energy.

The Hong Kong SAR Government needs to proactively remove our internal market impediments, which have held back development of wind and other forms of renewable energy. Inaccessibility of the power grid by IPPs has been the biggest obstacle. As the Government itself is the largest electricity consumer in Hong Kong, it has a strong market position to demand for substantial provision for wind energy from the two utility companies.

The power grid of the China Light & Power (CLP) has long been connected to that of Guangdong, which currently operates three wind farms of about 85 MW. Another 300 MW of wind energy capacity is expected to be in place by 2005. By mandating a minimum of 5% renewable energy in Hong Kong's energy mix and demanding for wind energy as a major consumer, the Government will provide a substantial incentive for further development of new wind farms in Guangdong and Hong Kong. To commercially provide wind energy, the Hong Kong Electric Co Ltd. (HEC) will therefore have to seek for both interconnection with CLP and other Mainland power suppliers and local investments in wind farms.

While the future regulatory framework beyond 2008 for the supply of electricity in Hong Kong should need a rigorous public policy debate, it is clear that grid access and power supply by IPPs will provide a more level playing field and promote price competitiveness while ensuring reliability of power supply. It is of critical importance that the Government NOT miss such opportunity to map out a future plan for renewable energy with CLP and HEC in the upcoming interim review of the schemes of control SoC.

Sincerely
Alex
Chair
Citizens Party

yours,
Chan

Rm 605 Gold & Silver Commercial Building,
12 - 18 Mercer St. Sheung Wan
Tel: 9336-6908
Email: achan@citizensparty.org

cc:
Environment, Transport and Works Bureau
Economic Development & Labour Bureau
Environmental Protection Department
Friends of the Earth, Hong Kong
Clear the Air

4 April 2003

Mr Roger Lai,
Director of Electrical and Mechanical Services Department
98 Caroline Hill Road, Hong Kong
(By Mail and Email)

Dear Mr Lai,

FoE's comments on and recommendations for the "Study on the Potential Applications of Renewable Energy in HK"

Friends of the Earth (Hong Kong) (FoE) is pleased to submit our views on the captioned Study. Our views and recommendations are based on the field study and findings by our research team, and general suggestions and recommendations gathered from our members and participants in the Wind Energy Forum 2003 organised by FoE on 1 March 2003.

Our major comments are:

- ◆ Energy-from-waste should not be classified as renewable energy
- ◆ The proposed renewable energy targets are excessively underestimated because renewable energy source from Guangdong is not included
- ◆ The HKSAR Government has unique and significant roles in jumpstarting wide-scale application of renewable energy in the region.

During the public consultation period, Friends of the Earth has also launched an electronic-signatory-petition for renewable energy as part of our work to harness public support for renewable energy. The petition has collected over 30 signatures from concerned members of the public from a wide spectrum of background, and received endorsement from 5 organisations including major green groups (The Conservancy Association and World Wide Fund for Nature Hong Kong), the Democratic Party and the Citizens Party. The support for this petition has demonstrated that the community at large has genuine concerns about the development of renewables in Hong Kong.

A list of the signatories and a copy of the statement of our signatory petition are enclosed for your reference.

FoE would be pleased to follow up on this issue, and to work in partnership with your department and other stakeholders to promote wide-scale application of renewable energy in Hong Kong.

Sincerely yours,

Mei Ng
Director

- Encl: 1. FoE's Review of and Recommendations for the *Study on the Potential Applications of Renewable Energy in Hong Kong*
2. Appendix 1: "**Wind Energy can Power Hong Kong**", a FoE research paper published in December 2002.
 3. List of the signatories in support of a renewable energy policy in Hong Kong
 4. Statement of the signatory petition

Review of and Recommendations for the
Study on the Potential Applications of Renewable Energy in Hong Kong
And
Comments on the Public Consultation Process for the Study

Submitted
By
Friends of the Earth (Hong Kong)

April 2003

Synopsis

This paper sets out the views of Friends of the Earth (Hong Kong) (FoE) on the *Study on the Potential Applications of Renewable Energy in Hong Kong* (the Study) based on a review of the Study by the research team of FoE, and general suggestions and recommendations gathered from our members and participants in the Wind Energy Forum 2003 organised by FoE on 1 March 2003.

The overall comments on the Study are:

- Energy-from-waste should **NOT** be classified as renewable energy and a classification as such in the Study gives a shaky ground and not well-supported arguments to its overall credibility.
- Renewable energy targets are excessively underestimated and this lessens the efficacy of the Study as the basis to recommend the future renewable energy development in Hong Kong.
- Renewable source from Guangdong is excluded in the Study.
- A lack of detailed and well-researched analysis of the unique role to be played by Hong Kong and the SAR Government in promoting wide-scale application of renewable energy.
- A lack of concrete suggestions for medium- to long-term goals to see to the implementation of a renewable energy policy in Hong Kong.

Based on our review of the Study and FoE's independent, long-term research into wind energy development in the Pearl River Delta Region, FoE makes recommendations in this paper as to:

- Address current policy deficiencies to make renewable energy implementation practicable and cost-effective;
- Map out future renewable energy development in Hong Kong, especially wind energy development; and
- Urge the SAR Government to take the lead in procuring renewable energy.

Relating to the release of the Study to the public, the process of public consultation for the Study is another area that FoE addresses in this paper and wishes that relevant departments will take our comments into consideration in later public consultation processes to enable that timely and thorough communication with the public is effected.

FoE would be pleased to follow up on this paper and the public consultation for the Study by way of meetings and consultation with relevant departments, LegCo members, academics and researchers engaged in renewable energy study, the media and interested public. We welcome your feedback and requests for copies of our published position papers and research reports.

Overview of FoE's Review of and Comments on the Study

1. Energy-from-waste should NOT be classified as renewable energy. If excluding "energy-from-waste" as a form of renewable energy, the Study's renewable energy targets will be substantially reduced to less than 0.08% by 2012, 0.46% by 2017 and 1.2% by 2022.

In contrary, wind energy has already become a main-stream energy source in some countries, for instance, Denmark, with the installed capacity of wind turbines of 2,880 MW, can meet 20% of its country electricity needs from wind power. The Study's renewable energy targets are excessively underestimated because:

a) Renewable energy source from Guangdong is excluded.

Importing wind energy from Guangdong is both **COMMERCIALY** and **TECHNICALLY VIABLE**.

The grid-connection-price of Guangdong's wind energy is now RMB0.61/kWh, which is already comparable to that of the nuclear-generated electricity (RMB0.49/kWh) that CLP has been importing from the Daya Bay Nuclear Plant in Shenzhen to Hong Kong.

If Hong Kong were to import wind energy from Guangdong to meet the HKSAR's 1% renewable target, about 400 GWh – an amount of electricity just slightly higher than what CLP has been importing from Chonghua pumped-storage power plant (300 GWh), it is expected that there will be no major unsolvable technical issue.

b) Targets are set based on some overly conservative assumptions.

The Study has assumed that 1 MW on-shore wind turbines and 1.5 MW off-shore wind turbines will be adopted to meet the targets. To date, however, the capacity of the largest commercially available wind turbine (on-shore) is already 3.2 MW. The technology of wind turbines has been rapidly evolving with new generations of turbines coming on stream. It is not justifiable to assume that the 1.2 MW model would still be used 10 years or even 20 years later. The Study, therefore, has overestimated the physical constraints of wind energy in Hong Kong.

c) Full costs of power generation are not evaluated.

If there is 5% renewable energy in Hong Kong's energy mix, there will be a reduction of 8,150 tonnes (14% of total sulphur dioxide emission from power plants) of SO₂, 7,150 (13%) tonnes of nitrogen oxides, 440 tonnes (13%) of particulates, and 1,834,000 tonnes (5%) of carbon.

According to recent estimates made by the Department of Community Medicine of the University of Hong Kong based on its year 2000 data, **given the above reduction in emission (8,150 tonnes of sulphur dioxide, 7,150 tonnes of nitrogen oxides and 440 tonnes of particulates), it would lead each year to the avoidance of:**

- **200 deaths from cardiovascular and respiratory causes.**
- **2,102 hospital admissions relating to cardiovascular and respiratory illnesses to Hospital Authority hospitals.**

2. HKSAR Government has unique and significant roles in jumpstarting wide-scale application of renewable energy in the region. FoE recommends the Government:

a) Formulate a renewable energy policy

b) Undertake further studies including a) a feasibility study of importing wind energy from Guangdong to Hong Kong, and b) an economic assessment of social benefits of renewable energy and its economic impacts on Hong Kong's target.

c) Set up an Energy Commission. At present there is a fragmented control of energy-related policy, hence hampering the integrated response at an appropriate scale. An energy commission will ensure all energy-related policies including conventional energy policy, renewable energy policy and greenhouse gas policy will be reviewed by an integrated approach, with well-coordinated efforts from a designated authority.

d) Replace the Scheme of Control Agreements with a more socially responsible policy. The post-2008 agreements should a) contain the necessary provision to guarantee the power companies' investment of renewable energy, b) secure full costing of fossil fuels, and c) avoid discriminatory access to renewable energy, preferably by setting up an independent transmission operator.

e) Set renewable energy as a prioritized energy source to meet the 2010 emission reduction target

f) Take the lead to procure renewable energy

TABLE OF CONTENTS

1.	FoE's Review of and Comments on the Study	
1.1	Introduction	2
1.2	Energy-from-waste should not be classified as renewable energy	2
1.3	Renewable energy targets are excessively underestimated	3
1.3.1	Renewable source from Guangdong is excluded	3
	a) Fundamental flaw to limit the source to Hong Kong's territory	
	i. Importing wind energy from Guangdong is COMMERCIALY VIABLE	
	ii. Importing wind energy from Guangdong is TECHNICALLY VIABLE	
	iii. Hong Kong's unique role in jumpstarting regional development of wind energy	
	b) Misconceptions about wind energy in Guangdong	
1.4	Overly conservative assumptions	7
1.5	Full costs including social costs have not been accounted for	7
2.	FoE's Proposed Scenario of a 5% Renewable Energy Target Based on Research Findings for Consideration	9
3.	FoE's Recommendations to the Government for Promoting Wide-scale Application of Renewable Energy	12
3.1	Formulate renewable energy policy	12
3.2	Undertake further studies	14
3.3	Set up an energy commission	14
3.4	Replace the Scheme of Control Agreements with a more socially responsible agreement	16
3.5	Prioritise renewable energy to meet 2010 emission reduction target	17
3.6	Take the lead to procure renewable energy	17
4.	FoE's Comments on the Public Consultation Process	18
	Contact Information	18
	LIST OF ILLUSTRATIONS	
Figure 1	From Guangdong wind farm to Hong Kong grid: the route of stepping up the voltage	4
Figure 2	Existing CLP's power grid extending from the New Territories, Hong Kong, into Guangdong	5
Box 1	Similarities between importing electricity from Chonghua pumped-storage power plant and Guangdong wind farms into Hong Kong's grid.	5
Table 1	Misconception about Guangdong wind energy	6-7
Table 2	Policies and/or statutory requirements of selected countries on the use of non-fossil fuel/renewable energy sources	12-13
Table 3	HK Government's fragmented structure for renewable energy development/ policy	14-15

1. FoE's Review of and Comments on the Study

1.1. Introduction

Friends of the Earth (Hong Kong) welcomes the release of the Study titled *Potential Applications of Renewable Energy in Hong Kong* as it is a first attempt to provide a comprehensive view of renewable energy in Hong Kong. It is particularly encouraging that the Study recognizes that wind energy is already **financially and technically viable**.

The Study concludes that internationally, the technology of land-based wind farms is *"mature and reliable, as evidenced by many overseas examples"*; and *"large land-based wind farms are potentially cost competitive with conventional power generation technologies"* and it is *"the least costly of the identified renewable energy options"* as the cost of wind energy ranges from \$0.2/kWh to \$0.35/kWh, compared with \$0.2/kWh to \$0.4/kWh of conventional energy.

FoE, however, after thorough review of the Study and based on our research into renewable energy, particularly wind energy, development in Hong Kong and the Pearl River Delta Region, would like to express our views and concerns about the following critical issues relating to wide-scale adoption of renewable energy, which are not duly addressed in the Study.

1.2 Energy-from-waste should not be classified as renewable energy

Around the world, a consensus of the definition of renewable energy has yet to be reached. However, a clearly defined and widely accepted definition is a prerequisite for an effective renewable energy policy that not only can help successfully promote wide-scale development of renewable energy, but can also help secure wide public support for renewables.

FoE is of the view that the renewable energy targets set by this Study have been heavily skewed towards "energy-from-waste", which is energy extracted during waste treatment such as gasification and that "energy-from-waste" should **NOT** be classified as a renewable energy source.

A generally definition is: renewable sources are inexhaustible energy from the nature such as wind and solar energy.

"Energy-from-waste" can be classified as "alternative energy source". Confusing "energy-from-waste" with genuinely renewable sources at this crucial time when the government has yet to formulate a decisive waste management programme in Hong Kong will no doubt hamper the effort to develop renewable energy in Hong Kong.

We agree with the Study that clarifying the term of renewable to genuinely renewable sources such as wind and solar *"is important in communications with the public and*

NGOs, and in retaining the credibility of environmental claims made for the technologies and programmes concerned" (Section 14.1 of the full version of the Study). It is therefore of paramount importance that renewable energy should be clearly defined at the outset. Although having stated this, the Study has failed to follow it through and has rendered its estimation unconvincing and its recommendations feeble.

1.3 Renewable energy targets are excessively underestimated

The Study proposes that contribution from renewable energy to annual power demand (against the baseline year of 1999) should be set at 1% by 2012, 2% by 2017 and 3% by 2022.

It should be noted that the Study places an extremely heavy reliance on "energy-from-waste" to meet the renewable targets. If excluding "energy-from-waste" as a form of renewable energy, the Study's renewable energy targets will be substantially reduced to less than 0.08% by 2012, 0.46% by 2017 and 1.2% by 2022.

This virtually zero target for the next 10 years is by no means justifiable, particularly if the global trend is put in context. With today's volatile fuel pricing, increasing environmental concerns and wind energy's cost competitiveness, around the world wind energy has become a main-stream energy source.

For example, Denmark, with the installed capacity of wind turbines of 2,880 MW, can meet 20% of its country electricity needs from wind power, whereas Germany, with the installed capacity of wind turbines of 12,001 MW by end-2002, can meet 4.7% of its national electricity needs from wind. As a matter of fact, wind is the world's fastest-growing energy source, with installed generating capacity quadrupled over the past five years from 7,600 MW at the end of 1997 to more than 31,000 MW at the end of 2002.¹

The Study projects that by 2012 onshore and offshore wind projects will only contribute 6GWh and 7GWh per year. This will only require the installation of ONE wind turbine (with 3.2MW capacity - the biggest commercially available wind turbine to date) erected on land and ONE turbine of the same capacity erected offshore to meet the target. This is an excessively underestimated target for wind energy as the technology is already mature enough and is destined to be more cost effective as the technology continues to evolve.

We are of the view that these vastly underestimated targets are the result of the following fundamentally flawed assumptions and unresolved issues:

1.3.1 Renewable source from Guangdong is excluded.

It is a fundamental flaw of the Study that it limits the sources of renewable energy to Hong Kong's territory. The Study fails to take into account the renewable energy sources from Guangdong whose development of wind energy is expected to mature and to achieve economies of scale in the near future.

¹ Website of American Wind Energy Association: <http://www.awea.org>, information as at 18 March 2003.

Hong Kong is situated in Guangdong which is a region of rich wind energy. Guangdong has a capacity of 30,000 MW for wind turbines (including on-shore and off-shore) and the provincial authorities are putting in place various support policies, including the Mandatory Market Share Concept, the Concession Model and the Renewable Energy Feed-in Tariffs, to streamline green energy development and to trim the cost down. Large-scale wind farms are about to happen and cheap wind energy will be easily accessible to Hong Kong.

Guangdong's wind development has been evolving since the 1980s. At present, its three wind farms (Nan' Ao, Hui Lai and Shan Wei) have about **a combined operating capacity of 85MW, and are feeding into the grid at an average of RMB 0.61/kWh.**

i) Importing wind energy from Guangdong is COMMERCIALLY VIABLE

This grid-connection-price of Guangdong's wind energy is now RMB0.61/kWh, which is already comparable to that of the nuclear-generated electricity (about RMB0.5/kWh) that CLP Hong Kong Ltd. has been importing from the Daya Bay Nuclear Plant in Shenzhen to Hong Kong. With many large wind farms in the pipeline and increased technology localisation, the cost per unit of capacity is set to fall.

ii) Importing wind energy from Guangdong is TECHNICALLY VIABLE

Guangdong's wind energy has been connected to Guangdong's provincial power grid.

In Guangdong, electricity generated by wind turbines has been pushed up to higher voltage by a series of transforming stations before connecting to the Guangdong power grid. **Figure 1** illustrates how wind energy from Shanwei wind farm connects to the Guangdong grid. Guangdong's power grid has a large capacity (Guangdong has a generation capacity of over 35000 MW already) and high reliability. It is therefore able to cushion any fluctuation in wind energy supply if wind development is contained in a manageable scale.



Figure 1. From Guangdong Wind Farm to Hong Kong Grid: the route of stepping up the voltage²

² Correspondence between Friends of the Earth (HK) and Guang Dong Ji Hua Wind Energy Co. Ltd., March 2003. Three existing wind farms in Guangdong are all connected to the Guangdong provincial grid. Hong Kong's two power utilities have yet to import wind energy from Guangdong, but CLP's grid has already been connected with the Guangdong provincial grid.

Hong Kong has been connecting to Guangdong's provincial power grid. As a matter of fact, Hong Kong and Guangdong have over two decades of experience in sharing power on their common grid (CLP, one of the two power utilities in Hong Kong, has been selling electricity to Guangdong since the late-1970s and CLP has been importing nuclear energy from the nuclear plant in Daya Bay, Shenzhen, since the mid-1990s) (**Figure 2**).

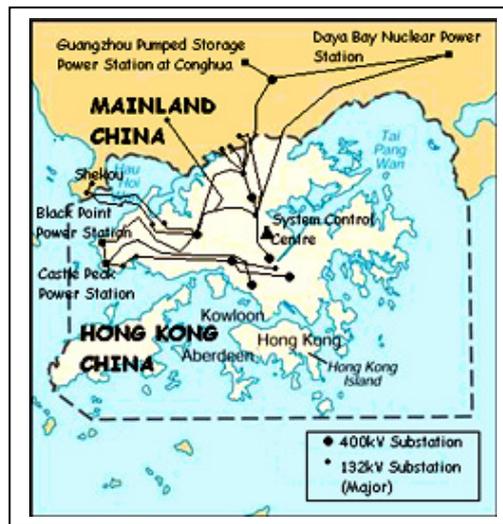


Figure 2: Existing CLP's power grid extending from the New Territories, Hong Kong, into Guangdong

When it comes to the issue of technical viability, it is of particular interest to compare the similarities between importing electricity from Chonghua pumped-storage power plant to CLP grid, (which CLP has **already** been practising) and importing wind energy from Guangdong in the near future (see Box 1 below).

Box 1. Similarities between importing electricity from Chonghua pumped-storage power plant and Guangdong wind farms into Hong Kong's grid.

The Daya Bay nuclear plant and the Chonghua pumped-storage power plant are a complementary system in which a portion of the electricity from the nuclear plant is transmitted to the Chonghua plant, in order to shift base load energy to peak demand times.

Since the mid-1990s, CLP in Hong Kong has been importing 75% of the electricity from the Daya Bay nuclear plant, by bringing in **10TWh/year directly from Daya Bay** (through two direct transmission cables connecting Daya Bay plant and CLP's grid in Hong Kong), and **300 GWh from Chonghua plant** (which is connected to the Guangdong's provincial grid via which electricity is transmitted to CLP).

The transmission route of electricity from "Chonghua plant" to "Guangdong provincial grid" and then to "CLP grid in Hong Kong" is a particularly valuable reference for wind energy because the transmission route for wind energy will be very similar if Hong Kong is to import wind energy from Guangdong.

Technical viability has been a major debatable area for the importation of wind energy from Guangdong. But it should be noted that the operation of this kind of transmission route has been well demonstrated for more than a decade in the case of Chonghua plant. For now, **if Hong Kong were to import wind energy from Guangdong to meet the HKSAR's 1% renewable target, i.e. about 400 GWh – an amount just slightly more than what CLP has been importing from Chonghua plant (300GWh), it is expected that there will be no major unsolvable technical issue.**

All we need now is some political stamina.

iii) Hong Kong's UNIQUE ROLE in jumpstarting regional development of wind energy

Hong Kong can play an important role in jumpstarting the development of wind energy in the Pearl River Delta Region. Hong Kong can facilitate economies of scale needed to substantially lower power generation costs to attract new players to the wind energy market so that they can go head-to-head with conventional generation without the need for mandates and subsidies in the near future.

Hong Kong is not only a green purchaser, but can also serve as a catalyst of the regional wind movement. With its leading legal and financial systems, Hong Kong can help attract international investors who often lack confidence in Mainland regulatory systems.

b) Misconceptions about Guangdong wind energy

There are, however, general misconceptions and misunderstandings about importing renewable energy from Guangdong. We would like to address them one by one here:

Table 1: Misconceptions about Guangdong wind energy

<p><i>Misconception 1: Connecting wind energy to Hong Kong power grid via Guangdong grid will lead to instability of Hong Kong grid.</i></p>
<p>Fact 1:</p> <ul style="list-style-type: none">♦ Guangdong's power grid has a large capacity (Guangdong has a generation capacity of over 35,000 MW already) and high reliability. Hence it is able to cushion any fluctuation in wind energy supply if wind development is contained in a manageable scale.♦ CLP has more than a decade of experience in importing electricity from Chonghua pumped-storage power plant (300 Gwh annually), which is also connected to Guangdong's grid.
<p><i>Misconception 2: Wind energy source is unreliable.</i></p>
<p>Fact 2:</p> <ul style="list-style-type: none">♦ Wind is by nature intermittent energy source. Wind does not blow all the time but there are proven strategies to manage it.♦ First, a wider wind network can reduce the total variation of power output—as more wind farms are connected over a larger area, the wind pattern affecting each is different (this points to the advantage of cooperation between Hong Kong and Guangdong on wind development).♦ Second, pumped storage to shift base load energy to peak demand times can be used to smooth out wind power variation.♦ In fact, wind energy has a unique role in Guangdong in strengthening the Guangdong power grid by improving the energy portfolio of Guangdong. Hydro power plants are of considerable scale in Guangdong. The rain season starts from April to August every year and the generation rate of hydropower drops significantly in winters. On the other hand, Guangdong has rich wind resources from every September to March. That makes wind and hydro perfectly complementary to each other.
<p><i>Misconception 3: Guangdong is running out of electricity. It is unrealistic to import green energy from Guangdong.</i></p>
<p>Fact 3:</p> <ul style="list-style-type: none">♦ Hong Kong can play an important role in jumpstarting the development of wind energy in the Pearl River Delta region. <p style="text-align: right;">.../continued on page 7</p>

- Shortage of electricity in some parts of Guangdong occurs in part because the Central Government has been restricting the building of conventional power plants due to pollution concerns whilst imports of cleaner power from the Western provinces are delayed by transmission extensions.
- Speeding up power capacity installation in Guangdong is a must. The key is whether the new power plants will be coal-fired, nuclear powered incurring pollution, or there will be wind farms. With the ease of construction and connection to the power grid, wind energy is particularly beneficial to Guangdong's energy situation as wind farms can be built quickly to respond to electricity shortages, say twelve months, assuming permits and resource assessments are complete. Wind energy, hence, is an important component of Guangdong's future energy market.
- With its leading legal and financial systems, Hong Kong can help attract international investors who often lack confidence in Mainland regulatory systems and facilitate the economies of scale needed to drive costs down to attract new players to the wind energy market so that they can go head-to-head with conventional generation without the need for mandates and subsidies in near future.

1.4 Overly conservative assumptions

We are of the view that the targets set out in the Study are deduced based on overly conservative assumptions. For all the 2012, 2017 and 2022 renewable targets, the Study has assumed that 1 MW on-shore wind turbines and 1.5 MW off-shore wind turbines will be adopted, some 107 wind turbines will have to be erected to fulfil the 2022 target. However, to date, the capacity of the largest commercially available wind turbine (onshore) is already 3.2 MW. As the technology is rapidly evolving, it is not justifiable to assume that a 1.2 MW model would still be used ten and even twenty years later. Hence the Study has overestimated the physical constraints of wind energy in Hong Kong, resulting in its hugely underestimated targets.

1.5 Full costs including social costs such as health costs of energy generation have not been accounted for

This Study fails to account for the estimated social costs of power generation in Hong Kong, which is a crucial piece of information for formulating renewable energy policy.

If there is to be a 5% renewable energy in Hong Kong energy mix, there will be a reduction of 8,150 tonnes (14% of total sulphur dioxide emission from power plants) of SO₂, 7,150 (13%) tonnes of nitrogen oxides, 440 tonnes (13%) of particulates, and 1,834,000 tonnes (5%) of carbon³. (please also refer to Section 2.G "What will be the impact on the environment" on page 11 for details).

The Department of Community Medicine of the University of Hong Kong has recently estimated that, based on its Year 2000 data, **given the above reduction in emission (8,150 tonnes of sulphur dioxide, 7,150 tonnes of nitrogen oxides and 440 tonnes of particulates), it would lead each year to the avoidance of:**

- ♦ **200 deaths from cardiovascular and respiratory causes**
- ♦ **2102 hospital admissions relating to cardiovascular and respiratory illnesses to Hospital Authority hospitals.⁴**

³ The estimation is derived based on the assumption that coal-fired plants will be replaced, according to year 2000 figures. Source: correspondence between Friends of the Earth (HK) and the Environmental Protection Department, December 2002.

⁴ Environmental Epidemiology Group, Department of Community Medicine, University of Hong Kong, April 2003.

We have to emphasise that the above estimation is based on the assumption that a reduction of such emissions would lead to a similar overall reduction in the mean ambient level of these pollutants. However, this estimation is still valuable and highly pertinent in the sense that it is clearly indicative of the benefits of even marginal increases in the use of renewable energy in Hong Kong.

External costs are difficult to quantify. However, they are real and can be immense if their impacts become externalized, and there is a rough consensus internationally that the external costs of coal-fired generation are around \$0.1/kWh.⁵

NONE of the social costs of fossil fuel-powered electricity are factored into the existing tariff. In other words, the public has been subsidising fossil fuels already, with the incurred social costs reflected on our medical bills, deterioration of quality of life, and the adverse impact on our international image.

There is an absence of a level playing field for renewable and conventional energy. However it should be noted that the pressure for power plants to internalise the social costs has been mounting and the cost of conventional energy is destined to rise.

Further studies on the social costs of conventional power generation and social benefits of renewable energy should be conducted.

⁵ "Size matters - getting bigger and cheaper", *Windpower Monthly*, January 2003.

2. **FoE's Proposed Scenario of a 5% Renewable Energy Target Based on Research Findings for Consideration**

Having illustrated that the Study's renewable energy targets are excessively underestimated, we proceed to give an illustration by putting together a scenario of a 5% renewable energy target with wind energy imported from Guangdong.

If Hong Kong were to import wind energy from Guangdong to achieve a 5% renewable target...

A. **How much electricity we need to import?**

Hong Kong's total energy consumption is about 37 TWh⁶. To meet the 5% renewable target, Hong Kong will need about 2TWh electricity from wind turbines. To generate 2TWh, wind farms with a total capacity of 1000 MW will be needed.

B. **How much land will be taken up?**

Wind farms of 1000 MW capacity will occupy an area of about 60km². Just across our border, Guangdong has abundant land which is cheap and readily available for wind turbines. Hong Kong has huge potential to cooperate with Guangdong for regional wind development and Guangdong can serve as a wind energy supplier for Hong Kong.

C. **How to finance the project?**

If HKSAR Government is to require the two local power companies to provide 5% renewable energy in their energy supply, the two power companies will have strong incentives to look for investment opportunities in Guangdong wind projects as wind energy has strong potential to be a mainstream energy source in both technological and financial aspects (see Section 1.3.1. on pp. 3-7 of this paper).

To date, the Guangdong Province has launched a series of financial incentives to promote wide-scale development of wind energy:

- ♦ **Guaranteed purchase**: the Guangdong grid company has to purchase all wind energy generated.
- ♦ **Land cost**: only the area actually occupied by the turbine foundation and other infrastructural facilities will be counted.
- ♦ **Tax concession**: there are TWO tax concessions for wind projects in Guangdong:
 - 1) **Value-added tax** has been reduced from 17% to 8.5% for wind projects.
 - 2) **Profit tax** has been reduced: the 33% profit tax is 100% waived in the first two years; reduced to 7.5% from the 3rd to 5th years, reduced to 15% for the 6th year and onwards.

⁶ Hong Kong Energy Statistics 2001 Annual Report, Census and Statistics Department, 2001.

It should be noted that the development of Shanwei Wind Farm gives an indication that Guangdong is reducing its reliance on foreign low-interest loans and has started to finance wind projects solely by investors, as Guangdong has been gaining experience in financing and constructing wind farms.

Phase I of Shanwei wind farm, of the scale of 16.5MW of generation capacity by twenty-five 660kW turbines, had its construction started in August 2002. Completion is due by April 2003. Phase I required an investment of RMB 138 million, one-third of which was drawn from low-interest loans from the Danish Government and the rest from Mainland investors.

Phase II, an extension of Phase I, involving 18MW generation capacity and RMB 130 million of investment, has recently started its planning process. The construction of Phase II is expected to be completed by end-2003. It should be noted that Phase II will be solely financed by investors. No international loan will be made for this Phase. The major reasons for such a change are: 1) banks are now more familiar with the finance of wind projects; b) there are proven success examples of the planning, construction and operation of wind farms in China.

D. How long will the construction take?

From wind monitoring to operation, the 1000 MW wind facilities in Guangdong can take no more than 4 years. Wind monitoring usually takes one to two years. Infrastructural works including building local grids and access roads will take one year. Construction works including building foundation, erecting wind turbines will take another one year.

CLP, one of the two power utilities in Hong Kong, in early-2003 has signed an agreement with Guangdong to start a feasibility study of wind resources in Yangjiang, 250km southwest to Hong Kong. If the wind resources are good enough, the study will lead to a wind farm investment of RMB 800 million with a generation capacity of 100 MW. In addition to this, an ABB's 200-MW off-shore wind farm project just off the shore of Nan'ao Island, Guangdong, is also in the planning process. In other words, 10 CLP's Yangjiang projects or 5 ABB's Nan'ao projects will be enough to meet this 1000 MW target.

E. What will be the impact on electricity price?

Assuming the Government will subsidise RMB400 million each year in the form of tax concessions, etc., the retail electricity price will only increase by RMB 0.004 as the price gap between wind and conventional energy can be spread out by the Guangdong grid

with existing capacity of 35,000 MW. The RMB400 million subsidy will bring the grid-connection-price of wind energy further down to RMB0.55/kWh, close enough to compete with conventional energy (grid-connection-prices of coal-fired, LNG-fired and nuclear are RMB0.35, 0.46 and 0.48 respectively).

The impact on Hong Kong's tariff is yet to be calculated. But two issues are worth to note: (a) The integration of renewable power into Hong Kong's power grid in the near future would have no significant impact on consumer rates because of its small capacity; and (b) The market price for wind is highly dependent on the regional context of energy policies, pollution costs, development sites, the wind resource, transmission access, and other issues.

F. What will be the impact on the environment?

If there is 5% renewable energy in Hong Kong's energy mix, there will be a reduction of 8,150 tonnes (14% of total sulphur dioxide emission from power plants) of SO₂, 7,150 (13%) tonnes of Nitrogen oxides, 440 tonnes (13%) of particulates, and 1,834,000 tonnes (5%) of carbon.⁷

G. What will be the impact on our health?

The Department of Community Medicine of the University of Hong Kong has recently estimated that, based on its Year 2000 data, **given the above reduction in emission (8,150 tonnes of sulphur dioxide, 7,150 tonnes of nitrogen oxides and 440 tonnes of particulates), it would lead each year to the avoidance of:**

- ♦ **200 deaths from cardiovascular and respiratory causes**
- ♦ **2102 hospital admissions relating to cardiovascular and respiratory illnesses to Hospital Authority hospitals.⁸**

⁷ The estimation is derived based on the assumption that coal-fired plants will be replaced, according to year 2000 figures. Source: correspondence between Friends of the Earth (HK) and the Environmental Protection Department, December 2002.

⁸ Environmental Epidemiology Group, Department of Community Medicine, University of Hong Kong, April 2003.

3. FoE's Recommendations to the Government for Promoting Wide-scale Application of Renewable Energy

3.1 Formulate a renewable energy policy

Support for wind energy from governments is currently needed because: (a) Conventional sources have unfair advantage because of subsidies; (b) Conventional sources incur minimal pollution charges; and (c) Initial capital investment of wind energy is high because of the newness of the technology, but operational costs are significantly lower than conventional energy as wind energy requires no fuel and relative costs are expected to fall with widespread commercialisation.⁹

As a level playing field for the supply of renewable and conventional energy is yet to be established, it is a common practice worldwide that countries help jumpstart the development of renewable are required to set a certain amount of renewable energy in their energy portfolios so as to spur investment and to facilitate the economics of scale needed to drive costs down – so that renewables can go head-to-head with conventional energy without the need for subsidies.

Around the world, many countries/economies have fully recognised the role of government in the development of renewable energy and have committed to a renewable energy target to ensure a market for renewable energy (Table 2).

Table 2. Policies and/or Statutory Requirements of Selected Countries on the Use of Non-fossil Fuel/Renewable Energy Sources

	Policies/Statutory Requirements
China	In 1995, the Central Government made new commitment to renewable energy, as outlined in the New and Renewable Energy Development Program, 1996-2010, which was developed by the State Economic and Trade Commission and the former State Planning Commission and State Science and Technology Commission. The project comprises the <i>installation of 190MW wind farms and 10 MW PV system from 1999 to 2004</i> , of which, Shanghai will install 20 MW wind turbines.
Republic of Korea	A target to supply 2% of total energy demand by new and renewable energy <i>by 2006</i> .
Australia	Set a mandatory target of an additional 2% of their power generation from renewable energy. This will move up the share of renewables to <i>11% by 2010</i> .
European Union	The Communication from the Commission entitled “Energy for the future: Renewable Energy Sources – White Paper for a Community Strategy and Action Plan (COM(97) 599 final)” and the European Council Resolution of 8 June 1998 on renewable sources of energy stipulate a target to double the share of renewable energies in gross domestic energy consumption across the EU from the present <i>6% to 12% on average by 2010</i> . All member states are required to set national (non-binding) targets for renewables to be consistent with the EU target. <i>...continued on page 13</i>

⁹ “Renewable Portfolio Standard: A Tool for Environmental Policy in the Chinese Electricity Sector,” *Energy for Sustainable Development*, Vol V No. 4, December 2001.

United Kingdom	Under the U.K.'s Non-Fossil Fuel Obligation Orders, introduced in 1989, more than 2% of its electricity (about 1,177 MW) must be generated from renewable sources. The U.K. aims to increase renewable output to 5 % <i>by 2003 and 10% by 2010</i> under the EU target. As part of its revised policy for renewable energy in the UK, the Government has introduced a new Renewables Obligation (RO) in 2000 to succeed the Non-Fossil Fuel Obligation (NFFO) and the RO has become the British government's main toll for achieving its target of 10% of UK electricity from renewables by 2010. ¹⁰
Republic of Ireland	In 1996, 2% of power was from renewable energy. Share of renewable energy in total energy supply to be increased to 5% <i>by 2010</i> . Ireland would be required to generate 13.2% of electricity by renewables by 2010 under the EU target.
Denmark	20% of electricity consumption from renewable energy by 2003. Denmark would be required to generate 29% of electricity by renewables by 2010 under the EU target. Denmark has committed to using 1.4 million tones of biomass for the production of electricity and heat, and to installing 750 MW offshore wind power capacity by 2005 and 2008, respectively.
The Netherlands	A target of 10% renewables in 2020. The Netherlands would be required to generate 12% of electricity by renewables <i>by 2010</i> under the EU target.
United States	Non-hydro renewables and alternative energy currently account for 2% of electricity needs. Hydropower provides about 7% of electricity supply. New York State requires, through an executive order, the purchase of no less than 10% <i>and 20%</i> of the overall State facility energy requirements from renewables <i>by 2005 and 2010</i> , respectively.

(Source: EPD, 2002¹¹)

Hong Kong's existing energy policy, however, pays too little attention to the environment. Our energy is to "ensure reliable and safe supply at reasonable costs¹²". In other words, our energy policy has its main focus on: 1) reliable supply of energy, and 2) stable and reasonable costs. There is minimal linkage between the current energy policy and vital environmental concerns. The Hong Kong SAR Government has to date made no commitment to developing renewable energy. While there have been some initiatives for promoting renewable energy, they have been few in number and among them, few voluntary by nature.

The SAR Government should commit to developing a specific policy to promote the wide-scale application of renewable energy in Hong Kong, with definitive targets and time frame.

¹⁰ Web page of the Department of Trade and Industry, U.K.: <http://www.dti.gov.uk/renewable/nffo.html>, as at 2 December 2002

¹¹ Environmental Protection Department, "Sustainable Development Provides a Better Future Environment," Paper presented at a forum entitled "Pursuing a Sustainable Future, 2002".

¹² Website of Economic Development and Labour Bureau: <http://www.edlb.gov.hk> as at 20 March 2003

When formulating a right combination of supporting policies such as Renewable Portfolio Standard, Renewable Energy Feed-in Tariffs and System Benefit Charge for renewable energy in Hong Kong, the Government should take into account international experience. Different approaches have come with success and have met with failure in different places depending on actual implementation processes and obstacles. In addition, transparency in the decision-making process of energy issues should be duly enhanced.

3.2. Undertake further studies

This Study is a first attempt to provide a full picture of renewable energy development in Hong Kong but has failed to address some of the key issues of wide-scale application of renewable energy. At least two further studies, as suggested below, should be undertaken to facilitate policy change and consensus building:

- a) a feasibility study of importing wind energy from Guangdong to Hong Kong;
- b) an economic assessment of the social benefits of renewable energy and economic impacts on Hong Kong's tariff (this study should take into account the impacts on both regional and local air quality, as Hong Kong has been adversely affected by regional air quality)

3.3. Set up an Energy Commission

In comparison to many other developed economies, Hong Kong lacks a well-coordinated authority to oversee the energy-related policies. This has resulted in fragmented control and lack of leadership in energy planning.

At present, responsibility for renewable energy policy resides with at least two bureaus and three departments, including Economic Development and Labour Bureau (EDLB), Environment, Transport and Works Bureau (ETWB), Electrical and Mechanical Services Department (EMSD), Environmental Protection Department (EPD) and Hong Kong Observatory (see Table 3 below).

Table 3: HK Government's fragmented structure for renewable energy development/ policy

Department/Bureau	Responsibility	Actions
Economic Development and Labour Bureau (EDLB)	<ul style="list-style-type: none"> ◆ Formulate and review energy policy ◆ Initiate renewable energy study ◆ Financial monitoring of electricity companies through Scheme of Control agreements with utilities ◆ Review applications for new power stations ◆ Member of Energy Advisory Committee 	<ul style="list-style-type: none"> ◆ Joint sponsorship with the Environment, Transport and Works Bureau for a consultancy study on renewable energy. The study examines the potential applications of several types of renewable energy technologies in Hong Kong. The study was released in February 2003. <p style="text-align: right;"><i>...continued on page 15</i></p>

Environment, Transport and Works Bureau (ETWB)	<ul style="list-style-type: none"> ◆ Formulate and review policies on increasing efficiency in energy consumption and monitor programme implementation ◆ Member of Energy Advisory Committee 	<ul style="list-style-type: none"> ◆ Joint sponsorship with EDLB for renewable energy consultancy study (see above)
Electrical and Mechanical Services Department – Energy Efficiency Office	<ul style="list-style-type: none"> ◆ Monitor electricity supply companies under the Scheme of Control Agreements ◆ Implement Energy Management programme ◆ Conduct energy audits ◆ Implement Building Energy Codes ◆ Implement water-cooled air conditioning systems ◆ Operate voluntary Energy Efficiency Labelling Scheme ◆ Implement Demand Side Management programmes ◆ Compile energy end-use data 	<ul style="list-style-type: none"> ◆ Involved in the EDLB and ETWB-commissioned renewable energy consultancy study (see above)
Environmental Protection Department	<ul style="list-style-type: none"> ◆ Compile Hong Kong air pollutants and greenhouse gases emission inventory ◆ Develop initiatives concerning global warming and related energy matters ◆ Promote environmental education and awareness through various programmes and campaigns ◆ Member of Environmental Campaign Committee 	<ul style="list-style-type: none"> ◆ Commissioned a consultant study titled “<i>Greenhouse Gas Emission Control Study</i>” in 2000
Hong Kong Observatory	<ul style="list-style-type: none"> ◆ Operate a network of 67 automatic weather stations located at various places in Hong Kong and gather wind resources data. 	<ul style="list-style-type: none"> ◆ Produced a report titled “<i>Wind Statistics in Hong Kong in Relation to Wind Power</i>” in March 2002.

(Source: Hong Kong SAR Government Website)

The fragmented structure has resulted in two major drawbacks:

First, there is a fragmented control of energy-related policies (for instance, the greenhouse gas policy and the energy policy are resided with the ETWB and the EDLB respectively), hence hampering the integrated response at an appropriate scale.

Second, the present fragmented structure fails to devote adequate and focused resources to energy planning. The Economic Development and Labour Bureau is the bureau responsible for energy policy review, but at the same time the bureau has the policy responsibility for a wide spectrum of areas ranging from reducing unemployment rate, resolving strained employer-employee relations, to developing economic infrastructure. “Energy” is only one of these many issues.

An energy commission will ensure that all energy-related policies including conventional energy policy, renewable energy policy and greenhouse gas policy will be reviewed by an integrated approach, with well-coordinated efforts from a single designated authority.

3.4 Replace the Scheme of Control Agreements with a more socially responsible agreement

The present Scheme of Control Agreements (SCAs) between the Government and the two local power companies are disincentive to renewable energy development because:

- (a) **False pricing.** The SCAs do not require power companies to take into account external costs of fossil fuels. In the absence of energy resources that take into account environmental concerns, it is evident that the power companies' shift in the use of different fuels depends on market prices of fuels, rather than for environmental reasons. While coal-powered plants produce much more pollution, the use of coal for energy production has increased 40% in recent years. Between 1997 and 2001, production has risen from 5,711,456 tonnes to 8,033,097 tonnes, while the price of coal plummeted about 30% from HK\$269/tonne to HK\$195/tonne from 1997 to 2001.¹³ As such, **full pricing** of fossil fuels is essential to provide a level playing field for renewable energy.
- (b) **SCAs' guarantee returns from fixed assets.** SCAs offer no financial incentives for power utilities to explore renewable.
- (c) **No Interconnection.** SCAs have no requirement of interconnection of energy grids provided by CLP Power and HEC. Although CLP Power has been connected with the Guangdong power grid for decades, HEC has been isolated and is not able to reach renewable sources in Guangdong. In fact, the Government has long recognised the need for interconnection. It was clearly stated in June 2000 in a reply from the Economic Services Bureau to the Legislative Council that *"we see increased interconnection, not just between the two power companies but also with Mainland China, as the logical way forward for the longer term."*

Hence, the existing SCAs should be replaced by a more socially responsible policy, one that is not discriminatory to renewable energy. The interim review of the SCAs next year will pave the way for the 2008 final review of the SCAs. It is now a most opportune time to convene a renewable energy debate in order to ensure that the post-2008 agreements will **(a) contain the necessary provisions to guarantee the power companies' investment in renewable energy, (b) secure full costing of fossil fuels, including environmental costs, in order to allow a sensible economic decision-making on energy choices, and c) avoid discriminatory access to renewable energy sources, preferably by setting up an independent transmission operator.**

An important point to note is that Hong Kong should remove the negative factors of deregulation in the course of replacing SCAs. Deregulation of the power market for open competition can destroy the goals of renewable energy and rational energy use

¹³ Census and Statistics Department, Hong Kong Energy Statistics 2001 Annual Report, 2001.

(e.g., California). New profit incentives for the power companies to develop clean power sources will benefit Hong Kong far more than a simple competition policy.

3.5 Renewable energy should be a prioritized energy source to meet the 2010 emission reduction target

Immediately following the release of the "Study of Air Quality in the Pearl River Delta Region"¹⁴ in April 2002, the HKSAR Government and the Guangdong Provincial Government announced a commitment to reducing by 2010 the regional emissions of the four major atmospheric pollutants, namely sulphur dioxide, nitrogen oxides, respirable suspended particulates and volatile organic compounds, by 40%, 20%, 55% and 55% respectively, using the emission level at 1997 as a base.

A concrete plan for such reductions is yet to be derived but it is noteworthy that there has been no indication from the HKSAR Government to consider renewable energy as a means to live up to its 2010 commitment. It should be noted that simply moving to "cleaner fuels" like natural gas is not enough. Renewable energy can help the Government make huge strides forward in meeting its 2010 targets. Hence, the Government should make renewable energy a prioritized energy source by offering supporting policies and incentives.

3.6 Take the Lead to Procure Renewable Energy

The Study suggests that the Government is the largest single power consumer in Hong Kong. Although the consultants cannot obtain a complete inventory of power consumption by the Government, Government Purchasing Agency data on shared office buildings alone suggest an annual consumption of 303 GWh. The Study also suggests that *"To this must be added Water Services Department consumption, Housing Authority purchases, and those of Environmental Protection Department, Drainage Services Department, Education Department"*, and *"Data made publicly available by CLP show that Government accounts absorbed 24% of the company's Hong Kong electricity sales in 2000."* (Section 12.4.3, full version of the Study)

Green purchase plays a catalytic role to renewable energy market. It should take the lead in the community to demonstrate preferential purchase of renewable energy and less greenhouse-intensive energy.

To date, public awareness of renewable energy has yet to be built up. Before the general public can comprehend the long-term benefits of renewable energy as opposed to its short time costs, the government has an important role in establishing a stable local market for renewable energy with its influence in the market.

¹⁴ Website of Hong Kong Government: <http://www.info.gov.hk/gia> as at 29 April 2002

4. FoE's Comments on the Public Consultation Process

Public access to the full version of the Study was only made available when this public consultation was already half-way through. The two-month public consultation began on 6 February and by that time only the 22-page executive summary of the Study was posted onto the Electrical and Mechanical Services Department's website and a CD-ROM of the full version was only available upon written request.

It was only following repeated requests, the 240-page full report was finally published online on 19 March, when there was only less than 3 weeks left for public consultation.

To make all the available information accessible to the public in a user-friendly way is the basis of a proper public consultation. The best available information will empower the concerned parties to give constructive suggestions to the authority and to make informed decisions in future.

- END -

This paper will also be posted on the website of FoE at: www.foe.org.hk

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內容撮要

1. 「廢物轉化能源」不應被視為可再生能源

2. 顧問漠視可再生能源的潛能，建議一個近乎「零」的可再生能源目標。根據顧問的建議，若剔除「廢物轉化能源」，二零一二年、二零一七年及二零二二年的可再生能源目標將分別只有 0.08%、0.46% 及 1.2%。

事實上，風力能已成為部分國家的主流電力供應，例如丹麥已設有 2,880 兆瓦的風力能裝置，足以供應丹麥百分之二十的電力供應。此研究主要因以下原因低估可再生能源在香港的發展空間：

2.1 未有考慮從廣東引入可再生能源的可能性。

從廣東引入風力能到香港，無論在價格上及技術上均已經可行。

價格：廣東風力能與廣東電網連接的上網價是每度電六毫一，而大亞灣核電廠的核電上網價是每度電是四毫九，兩者在價格上已可以競爭。

技術：事實上，中電現時每年由從化抽水蓄能電廠輸入三億千瓦時(300 GWh)，從化抽水蓄能電廠的電力須先駁上廣東電網再輸到香港中電的電網，與廣東風電駁上廣東電網的情況十分相似；另一方面，若從廣東輸入風電到香港以供應本港 1% 的用電量，以達到香港訂下 1% 的可再生能源目標，香港便需要輸入約四億千瓦時(400 GWh)的風電，與從化的輸電量規模相若，因此香港若要輸入四億千瓦時的風電不應有嚴重的技術性問題。

2.2 顧問採用了過份保守的假設

以風力能為例，根據顧問建議的可再生能源發展進度，到二零一二年香港的風力能供應為一千三百萬度電(13GWh)，換言之，屆時 只需豎立一座陸上風車，以及一座海上風車便足以達到 13 百萬度電的發電目標 (假設採用 3.2 兆瓦的風車)，這明顯是一個過低的目標。根據國際經驗，發展大型風力場的技術發展已成熟，而價格亦可以與傳統電力匹敵，風力能應有更大的發展空間。

2.3 並未評估傳統發電造成的社會成本

若香港訂立 5% 的可再生能源目標，將會減少 8,150 噸二氧化硫(香港電廠的二氧化硫總排放量的 14%)、7,150 噸氧化氮(13% 總排放量)、440 噸的懸浮粒子(13% 總排放量)及 1,834,000 噸的二氧化碳(5% 總排放量)。

根據香港大學的最新評估，以上的減幅(減少 8,150 噸二氧化硫、7,150 噸氧化氮及 440 噸懸浮粒子)將：

- ◆ 減少 200 宗因心臟及呼吸疾病引致的死亡
- ◆ 減少 2102 宗因心臟及呼吸疾病引致的入院個案

3. 港府在廣東省可再生能源的大規模發展中有重要的推動作用

3.1 制定可再生能源政策

3.2 進行進一步研究，包括 a) 香港從廣東輸入風力能的可行性研究，b) 可再生能源帶來經濟效益及對電價的影響。

3.3 成立電力局統籌可再生能源及其他相關政策(如溫室氣體政策)的發展。

3.4 改變現行的利潤管制計劃，以確保：1) 電力公司有推動力引入可再生能源；2) 電費可反映用電的整體成本，包括空氣污染等的成本，讓決策者在選擇能源供應的；3) 由獨立的電力公司負責電力輸送，以確保電網的透明度，此有助可再生能源的項目上網。

3.5 以可再生能源為「優先能源」，以達到二零一零年的減廢氣目標。

3.6 帶動採購可再生能源

Box 1: 若香港從廣東輸入風力能以達到香港 5%的可再生能源目標...

1. 香港需要輸入多少風力能?

香港的電力需求為 370 億千瓦時(37TWh)，要達到 5%的可再生能源目標則需要約 20 億千瓦時(2TWh)的可再生能源電力，需興建總裝置量為 1000 兆瓦的風力場。

2. 要多少地?

1000 兆瓦的風車場佔地約 60 平方千米，廣東有大量適合建立風力場的土地供應，香港應與廣東共同合作發展地域性的風力能，再從廣東供應風力能來港。

3. 投資額情況

如果港府訂立可再生能源政策，要求中電及港燈在電力供應中至少 5%必須來自可再生能源，兩電便會有推動力探索在廣東投資發展風力能的機會。

現時，廣東省政策正提供一系列的經濟優惠，以鼓勵風力能的投資，包括：

- **購買保證**: 所有廣東電網保證購買所有廣東風力能所生產的風電;
- **地價優惠**: 租地的面積只計算按風車的地基及其他設施實際佔地的面積
- **稅務優惠**: 增值稅由 17%減至 8.5%; 利得稅: 首兩年完全豁免, 第三至五年由 33%減至 7.5%, 第六年及之後由 33%減至 15%。

值得留意的一點是，汕尾風力場的最新發展顯示廣東省風力的發展由以往依賴外國低息/免息貸款轉為全數從股東集資，反映隨著廣東有越來越多興建風力場的經驗，銀行及投資者對風力的信心有所增加。

汕尾風力場第一期共有 25 台 660 千瓦風車，產電量共 16.5 兆瓦，由去年開始興建，預料在今年四月完工。第一期的投資額為一億三千八百萬人民幣，當中三分一來自丹麥政府的免息貸款，其餘三分二來自國內資金。

第二期擴建工程將另興建共 18 兆瓦、超過二十台的風車，計劃於今年底完工，投資額共一億三千萬人民幣。第二期工程將透過集資籌集資金，而不涉及外國貸款。

4. 建築期多久?

興建 1000 兆瓦的風力場，由風力監察至運作，可在四年內完成：風力監察般需要一至兩年，興建運輸道路、電網等配套設施需一年，而豎立風車則需要一年。

中電剛在今年初與廣東簽訂合約在廣東陽江進行維期兩年的風力監測，若風力資源充足，預計將興建一個 100 兆瓦的陸上風力場，投資額約八億人民幣；另一方面，ABB 公司亦計劃在廣東南澳島對開海面興建 200 兆瓦的海上風力場。因此，10 個中電的陽江發力場，或 5 個 ABB 的南澳海上風力場便足以提供 1000 千瓦的電力給香港。

6. 對香港電價有何影響?

假設廣東省政府提供每年四億人民幣的財政資助(如透過減稅)，由於廣東省電量龐大(3,500 兆瓦)，風力能與傳統電價的分別可由全國廣東省電網分擔，以 20 億千瓦時(2TWh)的風力能為例，只會令廣東省每度電的零售電價上升 0.004 元人民幣。

輸入二百萬兆風力能來港對香港電價的影響尚有待計算，但有兩件事值得留意：a) 由於輸入的風電量只佔香港整體電量的一小部分，對電價影響不會明顯；b) 風電的電價同時會受其他因素影響，包括電力政策、空氣污染的成本、當地的風力資源等影響。

7. 為環境帶來什麼好處?

若香港訂立 5%的可再生能源目標，將會減少 8,150 噸二氧化硫(香港電廠的二氧化硫總排放量的 14%)、7,150 噸氧化氮(13%總排放量)、440 噸的懸浮粒子(13%總排放量)及 1,834,000 噸的二氧化碳(5%總排放量)。

8. 對香港市民健康帶來什麼好處?

根據香港大學的最新評估，以上的減幅(減少 8,150 噸二氧化硫、7,150 噸氧化氮及 440 噸懸浮粒子)將：

- 減少 200 宗因心臟及呼吸疾病引致的死亡
- 減少 2102 宗因心臟及呼吸疾病引致的入院個案

Acknowledgement

Friends of the Earth (Hong Kong) would like to express our thanks to all who kindly provided advice and information to our energy team and campaign team. We owe special thanks to Mr. Yu Hong Ying of the Guangdong Ji Hua Wind Energy Co. Ltd, Dr. Josie Close and Prof. Anthony J. Hedley of the University of Hong Kong, and the Environmental Protection Department.

(Photo on the cover taken at Shanwei wind farm, Guangdong, by FoE (HK))

TABLE OF CONTENTS

	Overview	4
1	Introduction	6
2	Why Renewable?	7
2.1	HK has high carbon dioxide emissions per capita	
2.2	Power plants are major emitters of CO ₂ in HK	
2.3	Conventional energy is expensive with costly health impacts	
2.4	Wind energy is affordable	
2.5	Benefits of renewable energy	
3	How can wind energy power HK?	14
3.1	Current renewable energy projects in HK	
3.2	Most promising applications of wind energy in HK	
3.2.1	Integrating wind energy from Guangdong into Hong Kong's power grid	
3.2.2	Outlying islands	
3.3.3	Coastline and offshore sites	
4	Supporting approaches for wind development around the world	17
4.2.1	Renewable Portfolio Standard (RPS)	
4.2.2	Renewable Energy Feed-in Tariffs (REFITS)	
4.2.3	System Benefit Charges (SBC)	
4.2.4	Production Tax Credit (PTC)	
4.2.5	Others - Concession Model in China	
5	Action Plan for Hong Kong	23
5.1	Establish renewable energy policy and target	
5.2	Replace the existing Scheme of Control Agreements with a more socially responsible policy	
5.3	Establish an independent transmission operator for non-discriminatory grid access of renewable energy projects	
5.4	Provide clear planning guidelines for wind energy in HK	

LIST OF TABLES

Table 2.1	Ranking of the world's countries/regions by 1988 CO ₂ per capita emission rates
Table 2.2	The fuel mix for power generation in Hong Kong
Table 2.3	Estimated emission reduction of major air pollutants with 5% renewable energy in HK's energy mix
Table 2.4	Unit cost for wind energy around the world
Table 3.1	Renewable energy projects in HK
Table 4.1	Policies and/or statutory requirements of selected countries on the use of non-fossil fuel/renewable energy sources
Table 5.1	Case Study of the Educational BIPV projects at Ma Wan Primary School
Table 5.2	The HK government's fragmented structure for renewable energy development/policy

OVERVIEW

1. Why Renewable Energy?

- Renewable energy is the **only long-term solution to avert climate change**.
- Hong Kong emitted about 34,653,000 tonnes of carbon dioxide in 1999 and ranked 73rd in the world in per capita CO₂ emissions resulting in a yearly cost of about HK\$24 billion for damage from climate change. Hong Kong has the **social responsibility** to introduce renewables. China's ratification of the 1997 Kyoto Protocol serves as a reminder of Hong Kong's global responsibility.
- **57% of the installed capacity of local power generation is run on coal**, which is the dirtiest when compared with other fuels .
- **The two local power companies are also the biggest polluters** of both sulphur dioxide (47,750 tonnes, 80% of total emission) and nitrogen oxides (41,744 tonnes, 42% of total emission).
- **Fossil fuels incur serious external costs whereas the effects of renewable energy on improving air quality are obvious**. If 5% of local energy mix is generated by renewable energy, there will be a 14% reduction in sulphur dioxide emission, 13% reduction in both nitrogen oxides and particulates emissions, and 5% reduction in carbon dioxide emission.
- Wind energy is already **affordable and technically viable**. Unit cost for wind power is already equal or lower than conventional power plants in many places around the world.
- Renewable energy brings **wide social benefits** including creating job. It is estimated that Hong Kong will gain about **29,000 jobs** from renewable and energy efficiency projects.

2. How can wind energy power Hong Kong?

The most promising applications of wind energy in Hong Kong are:

- **Importing wind energy from Guangdong**. Integrating wind energy from Guangdong into Hong Kong's power grid, thus enabling wind energy to become a mainstream power component.
- **Outlying Islands**. Installing wind turbines on outlying islands that possess rich wind resources, especially those that are not connected to the power grid.
- **Coastline and offshore sites**, where Hong Kong's best wind resources can provide the lowest cost wind power.

3. Why should Hong Kong SAR government support renewable energy?

- Hong Kong is totally reliant on non-renewable energy sources but it is evident that the fossil fuel sources degrade the quality of life. However the local power plants are not required to pay for the full cost of their pollution.
- Wind farms have high initial investment because of the high capital costs, but they require low operational costs as they need no fuel. Government support therefore is crucial to provide incentive for investment.
- Many countries/economies around the world such as China, Republic of Korea and Denmark have already committed to setting a renewable target.
- The interim review of the existing Scheme of Control Agreements next year is an opportune time for the Government to implement a more socially responsible energy policy for Hong Kong.

4. What should Hong Kong do?

- Cooperate with Guangdong on policies for wind energy development.
- Establish long-term and increasing demand for renewable energy.
- Replace the existing Scheme of Control Agreements with a more socially-responsible policy.
- Establish an Independent Transmission Operator for non-discriminatory grid access of renewable energy projects.
- Provide clear planning guidelines for wind energy in Hong Kong.
- Set up a coordinated task force within the government for renewable energy development.

1. INTRODUCTION

Renewable energy is the essential and only long-term solution to avert climate change. Renewable energy has increasingly become an important component in the strategic control of air pollution worldwide. In both regional and local perspectives, four issues underscore that renewable energy is a vital part of the solution for Hong Kong: (a) China announced its ratification of the 1997 Kyoto Protocol in August this year at the 2002 World Summit on Sustainable Development in Johannesburg; (b) A consensus to increase the use of renewable energy was reached at the Earth Summit; (c) The Asia-Pacific Economic Cooperation (APEC), of which China and Hong Kong are both member economies, upholds the energy policy principle of implementing pricing practices based on full costing of energy supplies, and hence incentives should be given for renewable energy development;¹ and (d) The recent "Study of Air Quality in the Pearl River Delta Region" published in April 2002 called for a regional cooperation to bring long-term improvement to air quality in the region.

1.1 Air pollution is serious in Hong Kong and yet Hong Kong totally relies on non-renewable polluting fuels (coal, gas, oil and uranium) and lacks appropriate energy policy for energy efficiency and energy conservation. The following issues are noteworthy:

- Hong Kong still fails to meet the air quality objectives (AQO's) occasionally, although the local AQO's are much more lax than the World Health Organisation's recommendation;²
- The use of coal, which is the most polluting fuel for the existing local power plants, has increased 40% since 1997 due to cheap supply of coal from Indonesia after the Asian financial crisis in 1998;³
- Hong Kong's energy policy provides no incentive for energy efficiency because local power plants are guaranteed asset-based returns under the Scheme of Control Agreements;
- Hong Kong's energy policy requires no environmental or social costing of pollution;
- Hong Kong's energy policy provides no incentives for renewable energy technology.

1.2 This paper presented by Friends of the Earth (Hong Kong) intends to demonstrate why and how wind energy can, and should be a mainstream power component in Hong Kong. In particular, the paper underscores the opportunities and importance of the regional cooperation on wind energy development for a sustainable Hong Kong.

2. WHY RENEWABLE?

2.1 HONG KONG HAS HIGH CARBON DIOXIDE EMISSIONS PER CAPITA

2.1.1 According to 1998 figures, Hong Kong emits 35,653,000 tonnes of carbon dioxide (CO₂) – the largest component of greenhouse gases (GHG) – and ranks 73rd in the world in per capita CO₂ emissions (Table 1). Hong Kong has equal CO₂ emissions compared to many European countries that have already ratified the Kyoto Protocol, such as France, Spain, Portugal, Switzerland and Sweden, and much higher per capita emissions than China,

¹ Website of Energy Information Administration, retrieved 11 December 2002, from <http://www.eia.doe.gov/emeu/cabs/apec/apecbook.html>. The APEC energy policy principle recommends member economies to implement "pricing practices which reflect the economic cost of supplying and using energy across the full energy cycle, having regard to environmental costs."

² Website of Friends of the Earth (HK), retrieved 11 December 2002, from http://www.foe.org.hk/welcome/geten.asp?id_path=1,%207,%2028,%20150,%20868.

³ Census and Statistics Department, [Hong Kong Energy Statistics 2001 Annual Report](#), 2001. The import of coal has risen 40% from 5,711,456 tonnes in 1997 to 8,033,097 in 2001, while the price of coal has plummeted about 30% from HK\$269/tonne to HK\$195/tonne from 1997 to 2001.

which has also ratified the Protocol.

- 2.1.2 Hong Kong is responsible for 0.2% of the world's GHG emissions and a yearly cost of about HK\$24 billion for damage from climate change (3% of HK's GDP).⁴
- 2.1.3 Hong Kong is not a signatory party of the Kyoto Protocol, but as a developed economy, Hong Kong does have responsibility as a global citizen to contribute to the international effort of controlling GHG emissions to slow down climate change.

Table 2.1: Ranking of the world's countries/regions by 1998 CO₂ per capita emission rates (Select List)

Countries/Regions	CO ₂ per capita emissions (metric tonnes of carbon) in 1998	1998 World Ranking	Status of Kyoto Protocol Ratification
U.S. Virgin Islands	33.99	1	N/A
United Arab Emirates	10.23	3	N/A
Singapore	6.46	8	N/A
United States of America	5.43	10	*
Australia	4.88	14	*
Canada	4.17	17	*
Saudi Arabia	3.83	19	N/A
Germany	2.75	27	R
Russian Federation	2.66	30	*
Taiwan	2.63	32	N/A
United Kingdom	2.51	34	R
Japan	2.45	36	At
New Zealand	2.16	43	*
Republic of Korea	2.15	45	R
France	1.72	59	Ap
Spain	1.70	60	R
Portugal	1.51	70	Ap
Sweden	1.50	71	R
Hong Kong	1.47	73	N/A
Malta	1.28	80	R
Chile	1.11	90	R
Macau	0.97	94	N/A
Thailand	0.87	100	R
China	0.68	107	Ap
India	0.29	141	Ac

Remarks: R=Ratification, At=Acceptance, Ap=Approval, Ac=Accession

* indicates countries/regions that have signed the Kyoto Protocol but have not acceded to it

N/A indicates countries/regions that are not signatories of the Kyoto Protocol

(Source: Carbon Dioxide Information Analysis Center, U.S. Department of Energy, and United Nations Framework Convention on Climate Change website.⁵)

2.2 POWER PLANTS ARE MAJOR EMITTERS OF CO₂ IN HONG KONG

⁴ Friends of the Earth (HK), *Agenda 2047*, 2000.

⁵ Website of Carbon Dioxide Information Analysis Center, U.S. Department of Energy, *Trends: A Compendium of Data of Global Change*, retrieved 10 Dec 2002, from http://cdiac.esd.ornl.gov/trends/emis/em_cont.htm; and the website of the United Nations Framework Convention on Climate Change, retrieved 10 December 2002, from <http://unfccc.int>.

2.2.1 CO₂ is the dominant GHG in Hong Kong, accounting for over 80% of all GHG emissions in CO₂-equivalent terms.⁶ Local power plants are the major emitters of CO₂ (responsible for 64% of local CO₂ emission⁷) as coal is the most common fuel for power generation. **57.1% of the installed capacity⁸ is run on coal**, which is the dirtiest, in terms of CO₂ emission, when compared with other fuels (Tables 2 & 3).

Table 2.2: The fuel mix for power generation in Hong Kong

Fuel	EEF (tCO ₂ /TJ) (*which is the dirtiest fuel) ⁹	% of Installed Capacity	Fuel used for power generation (TJ) in 2001	Emission of CO ₂ in 2001 (Million Tonnes)	Local Electricity Consumption (TWh)(exclude China Exports)	% of Local Electricity
Coal	92.7	57.1	200,402	18.6	19.0	46%
Oil	62.4	9.6	1,719	0.1	0.5	1%
Natural Gas	55.8	16.2	95,403	5.3	11.7	28%
Nuclear Energy & Pumped Storage	6.0	17.1	112,500	0.7	10.0	24%
Total					41.2 (includes system losses) ¹⁰	100%

(Source: Economic Development Branch, 2002;¹¹ and Census and Statistics Department;¹² and Leung et al., 2000.¹³)

2.2.2 It is estimated that if there is 5% renewable energy in Hong Kong's energy mix, there will be a reduction of 1,834,000 tonnes of CO₂ emissions (5.1% of total emissions).¹⁴

2.2.3 In general, by introducing wind energy into the energy mix, overall CO₂ emissions can be reduced. A single 750-kilowatt (kW) wind turbine, typical of those now being installed at power plants around the world, produces roughly 2 million kilowatt-hours (kWh) of electricity annually.¹⁵ Based on the U.S. average fuel mix, approximately 1.5 pounds of CO₂ is emitted for every kWh generated. This means that an average wind turbine can offset the emission of 2 million kWh x 1.5 pounds CO₂/kWh = 3 million pounds of CO₂ = 1,500 tons of CO₂ each year. As a forest absorbs approximately 3 tonnes of CO₂ per acre of trees per year, a single 750kW wind turbine prevents as much CO₂ from being emitted each year as could be absorbed by 500 acres of forest.¹⁶

⁶ Environmental Resources Management, "Greenhouse Gas Emission Control Study: Revised Executive Summary," 2000.

⁷ Environment and Food Bureau & Environmental Protection Department, "Greenhouse Gas," Paper for Legislative Council Panel on Environmental Affairs, 2001.

⁸ Website of Economic Development Branch, retrieved 11 September 2002, from <http://www.edlb.gov.hk/edb>. Hong Kong has a total installed electricity generating capacity of 11,568 MW (including 70% of the capacity of units 1 and 2 of the Daya Bay Nuclear Power Station and 50% of Phase 1 of the Guangzhou Pumped Storage Power Station).

⁹ Effective emission factors (EEF) is a good tool for convenient calculation of CO₂ emissions. These factors can be expressed on energy basis to compare the "cleanliness" of fuels in terms of CO₂ emissions.

¹⁰ If system losses are excluded, the local electricity consumption is 37 TWh.

¹¹ Economic Development Branch, Economic Development and Labour Bureau, "Policy Responsibility," retrieved 10 July 2002, from <http://www.edlb.gov.hk/edb/response/4.htm>, last update: July 2002.

¹² Census and Statistics Department, Hong Kong Energy Statistics 2001 Annual Report, 2001.

¹³ D. Y. C. Leung et al., "Greenhouse Gas Emission in Hong Kong," University of Hong Kong, 2000.

¹⁴ The estimation is derived based on the assumption that coal-fired plants are replaced with year 2000 figures. Source: personal correspondence between Friends of the Earth (HK) and the Environmental Protection Department, December 2002.

¹⁵ Website of American Wind Energy Association, retrieved 13 September 2002, from <http://www.awea.org>.

¹⁶ Website of American Wind Energy Association, retrieved 13 September 2002, from <http://www.awea.org>. And the

2.3 CONVENTIONAL ENERGY IS EXPENSIVE WITH COSTLY HEALTH IMPACTS

Besides contributing to climate change, power plants are also major polluters that have been damaging our ambient air quality.

- 2.3.1 The two local power companies, CLP Power Hong Kong Limited (CLP Power) and the Hongkong Electric Co. Limited (HEC), are the biggest emitters of both sulphur dioxide (SO₂) and nitrogen oxides (NO_x) in 1999. They accounted for 47,750 tonnes of SO₂ emissions (about 80% of total emissions), and 41,744 tonnes of NO_x emissions (about 42% of the total). Their power plants also emitted 2,790 tonnes of particulate matters, 3,024 tonnes of carbon monoxide emissions, and 258 tonnes of non-methane volatile organic compounds emissions in 1999.¹⁷

Fossil fuel external costs are very real. These external costs include respiratory and cardiovascular diseases, reduced work productivity, damage to agricultural crops, tourism decline, and natural disasters related to climate change.

- 2.3.2 According to a study recently released by the Department of Community Medicine of the University of Hong Kong, the reduction of SO₂ in ambient air had a direct and major effect on death rates. It was found that the almost 50% reduction of SO₂ from 40mg/m³ to 20mg/m³, reduced on average about 600 deaths from respiratory and cardiovascular diseases every year, and added 20 to 40 days per year to the average lifespan of Hong Kong residents. The study provided direct evidence that control of SO₂ pollution has immediate and long-term health benefits.¹⁸

- 2.3.3 An earlier study in 1996 undertaken by the University of Hong Kong also demonstrated the harm caused by sulphur pollutants to the health of Hong Kong children. There was a marked increase in the risk of bronchitic symptoms (including cough, phlegm and wheeze) between the most polluted and least polluted districts.¹⁹

- 2.3.4 Furthermore, two recent studies show the economic cost of air pollution: (a) A report commissioned by the Environmental Protection Department found that the total economic cost of the health effects in a year for morbidity and mortality for combined respiratory and cardiovascular diseases by pollutants (including nitrogen dioxide, SO₂, respiratory suspended particulates, and ozone) using Cost of Illness (COI) estimates was HK\$3,840.72 million (0.35% of Hong Kong's GDP). These estimates were based on 1996 data on air pollution, hospital admissions and out-patient doctor consultation related to respiratory and cardiovascular diseases;²⁰ (b) Another study released by the University of Hong Kong in May 2002 concluded that more than 17,000 Hong Kong residents are admitted to

roughly 3 billion kWh that are produced each year by California's wind power plants displace CO₂ emissions of 4.5 billion pounds (2.25 million tons), or as much as could be absorbed by a forest covering more than 1100 square miles.

¹⁷ Website of Environmental Protection Department, "Hong Kong Air Pollutants Emission Inventory 1999," retrieved October 2002, from <http://www.info.gov.hk/epd>.

¹⁸ A. J. Hedley et al., "Cardiorespiratory and all-cause mortality after restrictions on sulphur content of fuel in Hong Kong: an intervention study," The Lancet Vol. 360, 23 November 2002.

¹⁹ J. Peters, A. J. Hedley et al., "Effects of an ambient air pollution intervention and environmental tobacco smoke on children's respiratory health in Hong Kong," International Journal of Epidemiology Vol 25 No.4, 1996.

²⁰ EHS Consultants Limited, "Study of Economic Aspects of Ambient Air Pollution on Health Effects," 1998. Available at http://www.epd.gov.hk/epd/english/environmentinhk/air/study/rpts/effect_econ_amb_ap.html. The study also concluded that based on the WTP (willingness-to-pay) estimate, the total economic cost for morbidity and mortality is estimated to be HK\$5,637.19 million (0.51% of GDP). Note: The gap between monetary values estimated by COI and WTP methods is mainly attributable to the factors considered in each of the approach. WTP estimates take into consideration non-market values such as pain and suffering over and above direct health related expenditure and earning loss. Hence, WTP approach is expected to reveal a higher economic cost.

hospital each year and spend nearly 76,000 days off work or school because of air pollution-related heart and lung diseases. The study also found that 4,300 Hong Kong residents die prematurely from inhaling polluted air in the territory, and it costs the Hospital Authority at least HK\$227.5 million a year to treat pollution-related illness.²¹

2.3.5 The effects of renewable energy on improving air quality are obvious. It is estimated that if there is 5% renewable energy in Hong Kong energy mix, there will be a 14% reduction in SO₂, 13% reduction in both NO_x and particulates emissions, and 5% reduction in CO₂ emission (Table 3).²²

Table 2.3: Estimated emission reduction of major air pollutants with 5% renewable energy in Hong Kong's energy mix

Air Pollutants	Estimated Emission Reduction (assuming coal-fired plants are replaced)	
	tonnes	% of emissions from power plants
Sulphur Dioxide (SO ₂)	8,150	14.2%
Particulates	440	13.3%
Nitrogen Oxides (Nox)	7,150	13.0%
Carbon Monoxide (CO)	190	7.4%
Non-methane Volatile Organic Compounds	20	7.2%
Carbon Dioxide (CO ₂)	1,834,000	5.1%

(Source: Unpublished information from the Environmental Protection Department)

2.3.6 Hong Kong's new air pollution records this month²³ signal the alarming decline in the region's quality of life. Hong Kong needs to add up real energy costs in order to prioritise its economic decision-making on energy choices. If pollution costs are added to fossil fuels, their price roughly doubles, which makes renewable energy technologies like wind power the best economic choice.

2.4 WIND ENERGY IS AFFORDABLE

2.4.1 Of all renewable sources of energy, wind power is the closest to achieving commercial viability. Unit cost for wind power is already equal or lower than conventional power plants in many places around the world.

Table 2.4: Unit cost for wind energy around the world

Price/kWh	Germany (Deutschemark)	United States (U.S. cents)	Denmark (Krone)	United Kingdom (Penny)	China (RMB)
Wind power	0.178	4-5	0.60 (Private) 0.43 (Power company)	2.88 (Big project)	0.61
Gas power		3.9-4.4		1.8-2.2 (CCGT)	
Coal power	0.11 ²⁴	4.8-5.5		2.6-3.25	0.35

(Source: Center for Renewable Energy Development of the Energy Research Institute under the State Development Planning Commission in China, 2002.)

²¹ C M Wong et al., "A Tale of Two Cities: Effects of Air Pollution on Hospital Admissions in Hong Kong and London Compared," *Environmental Health Perspectives*, Vol 110, January 2002; "Dirty air lays 17,000 low each year," *The South China Morning Post*, 4 May 2002.

²² The estimation is derived based on the assumption that coal-fired plants are replaced with year 2000 figures. Source: personal correspondence between Friends of the Earth (HK) and the Environmental Protection Department, December 2002.

²³ "The general air pollution index reached a record high of 185 in Tung Chung on 9 September 2002," *The South China Morning Post*, 10 September 2002.

²⁴ It should be noted that the coal price in Germany is heavily subsidised by the government.

- 2.4.2 To take the U.S. state, Texas, as an example, wind power is competing directly with coal and natural gas-fired electricity. Texas has mostly good wind resources combined with a strong legislation requiring minimum renewable energy in the power mix. 915 MW of wind capacity was built in Texas in 2001 under the competitive bids, producing a flood of low-priced wind power in the conventional power mix while retail prices have dropped 6% due to deregulation. Retail competitor Green Mountain Energy is offering 100% wind power at the same kWh price as conventional power (US\$0.081/kWh). Most importantly, wind power prices continue to decline as production scale expands while global fossil fuel prices are destined to move upwards as global trends point to the fact that they are required to internalise their pollution costs.
- 2.4.3 For Hong Kong, two issues are worthy to note: (a) The integration of renewable power into Hong Kong's power grid in the near future would have no significant impact on consumer rates because of its small capacity; and (b) The market price for wind is highly dependent on the regional context of energy policies, pollution costs, development sites, the wind resource, transmission access, and other issues.
- 2.4.4 In summary, uncertainty over prices should not deter the immediate integration of wind power into Hong Kong's grid as any impact on consumer prices, either positive or negative, will be insignificant at this early stage. Hong Kong will gain immensely from the learning process of implementing sustainable technologies, resulting in fewer institutional barriers and more efficient deployment of renewable energy later on wider scale.

2.5 BENEFITS OF RENEWABLE ENERGY

2.5.1 Energy Security

Hong Kong has no indigenous fossil fuel resources; we have to rely entirely on imported fuels. Besides large quantities of oil products, we also imported about 6 million tonnes of coal and 2.2 million tonnes of natural gas in year 2000, both for electricity generation.²⁵ Although energy security has not been a very acute problem for Hong Kong, Hong Kong has relied on the United States to maintain oil resource access and our economy has suffered in times of high oil prices, although not to the extent as great as other industrialized economies.

2.5.2 Creation of Jobs

- 2.5.2.1 Wind energy can create job opportunities not only during the construction period, but also from the considerable maintenance, service and repairs works to be undertaken during the operational life.
- 2.5.2.2 Keeping a renewable energy economy going requires more hands and minds than the same capacity of fossil fuel power, which is a more capital-intensive industry. Friends of the Earth (HK)'s study on sustainable development estimates that Hong Kong will gain about 29,000 jobs from renewable and energy efficiency projects.²⁶
- 2.5.2.3 In particular, it is estimated that every MW of installed wind capacity creates about 60 person years of employment and 15-19 jobs. Therefore, a typical 50 MW farm creates 3000 person years of employment.²⁷

²⁵ Electric and Mechanical Services Department, "Highlights and Prospects of Energy Consumption in Hong Kong," retrieved 1 July 2001, from http://www.emsd.gov.hk/emsd/e_download/wnew/Conference_Papers/HIGHLIGHTS_AND_PROPECTS_OF_ENERGY_CONSUMPTION_IN_HK.pdf.

²⁶ Friends of the Earth (Hong Kong), *Agenda 2047*, 2000.

²⁷ Website of American Wind Energy Association, retrieved Jul 02, from <http://www.windenergyaction.com>.

2.5.2.4 A European Commission report published in 1999 estimated that worldwide employment in the wind power industry to be in the range of 30,000 to 35,000 jobs in 1995. For future employment, the Commission estimated 960,000 jobs to be created in the wind energy sector within the European Union member states by 2020.²⁸

2.5.3 Other Social Benefits

Wind energy projects can enhance development in rural areas in China with their supporting infrastructure work, e.g., building local grid and access roads. More economic opportunities in rural areas will enhance population stability and therefore lessen the population pressure from China on Hong Kong.

3. HOW CAN WIND ENERGY POWER HONG KONG?

3.1 Current Renewable Energy Projects in Hong Kong

Presently, renewable energy projects in Hong Kong are limited to niche markets, such as offsetting diesel use on outlying islands, educational/utility research pilot projects, or eco-tourism attractions (Table 5). Although valuable for promoting public understanding of renewable energy, the economics of all these types of renewable projects are not representative of large-scale investment by power utilities and supported by solid government policy and incentives.

Table 3.1: Renewable Energy Projects in Hong Kong

Type of Renewable Energy	Application
Wind Energy	1. An automatic weather station at Sha Chau (a small island about 6 km north of the Hong Kong International Airport on Lantau Island) is operating on wind energy in addition to solar energy.
	2. HEC funded a small-scale windmill for a YMCA hostel on Lamma Island.
	3. CLP Power funded a renewable project on Shek Kwu Chau that consists of a 2.5 kW wind turbine and a 3.36kW photovoltaic system. ²⁹
Solar Photovoltaic (PV)	1. About 60% of the major battery-operated aids for navigation in Hong Kong waters are powered by solar energy so as to reduce refuelling costs.
	2. The Hong Kong Observatory has been using PV panels to power remote automatic weather stations since the 1980's.
	3. PV system for lighting is used in the Kowloon Walled City Park.
	4. PV with storage battery is used for street lighting at the Kadoorie Farm and Botanic Garden at Kwun Yum Shan.
	5. KMB has installed adjustable photovoltaic panels and lead acid batteries to generate electricity for the electronic information system and advertising panels at a bus shelter.
Solar Thermal	1. Solar thermal systems using sunlight to heat water directly or indirectly have been installed at nine government premises with a total solar collection area of over 1,700 m ² since 1978. These premises include: <ul style="list-style-type: none"> • Hei Ling Chau drug addiction treatment centre • Shek Pik Prison on Lantau Island • Tuen Mun hospital • A swimming pool complex in Kwai Chung • Sheung Shui slaughterhouse
	2. A hotel/office complex in Tsimshatsui uses solar thermal systems for water heating.
	3. HEC's Lamma Power Station uses solar energy for water heating.

²⁸ European Commission, "Wind Energy - The Fact, Volume 3," 1999.

²⁹ Tai Kung Pao, 12 June 2002.

(Source: Environmental Protection Department, 2002^{30&31})

3.1.1 Contrary to Hong Kong's absence of wide application of renewable energy, international experience has already demonstrated that renewable energy can be a mainstream energy component.

3.1.2 It should be noted that different kinds of renewable energy, such as wind and solar, are supplementary in nature because they possess different characteristics in terms of physical constraints, the time of peak power-generated, and etc. For example, wind energy is the most economical renewable energy for large-scale and regional application, especially if a network of regional wind farms (e.g. Guangdong, including Hong Kong) is developed, whereas solar energy is more feasible for Hong Kong urban and remote off-grid power systems.

3.2 MOST PROMISING APPLICATIONS OF WIND ENERGY IN HONG KONG

3.2.1 INTEGRATING WIND ENERGY FROM GUANGDONG INTO HONG KONG'S POWER GRID—Thereby allowing wind energy to become a substantial element in the local energy mix

3.2.1.1 Guangdong's wind development has been evolving since the 1980's. Its three wind farms in Nan'ao, Huilai and Shanwei presently have about 85MW of operating capacity, and are feeding into the grid at an average of RMB0.61. The next generation of wind projects of up to 300 MW is expected to be in place in the next five years.

3.2.1.2 It is a common misconception that renewable energy has yet to achieve economic viability and will raise electricity tariffs. We should take note of the following facts:

- Even in Guangdong's immature wind power market where small projects and insufficient localization drive up costs, wind is only slightly more expensive (RMB0.61/kWh) than nuclear power, which CLP Power imports from the Daya Bay Nuclear Power Station.
- With many large wind farm projects in the pipeline and increased technology localization, the cost per unit of capacity and thus the wind power price are destined to fall. The scale of wind farms in Guangdong is expected to increase rapidly as Guangdong has been seriously contemplating various wind support policies, including the Mandatory Market Share Concept, the Concession Model and the Renewable Energy Feed-in Tariffs (details in Section 4), to streamline green energy development.
- As polluting fossil fuel and nuclear power plants are forced to internalise their real health and environmental costs, wind will definitely be the least costly power supply of the near future.

3.2.1.3 Hong Kong is no stranger to trading energy with Guangdong. CLP Power has been importing power from the Daya Bay Nuclear Power Station and the pumped storage power station at Conghua since the 1990's, while exporting power to China since 1979. Hong Kong and Guangdong have over two decades of experience in sharing power on their common grid and it is in our common interest to continue this cooperation to benefit renewable energy development. For now, Hong Kong has exciting opportunities to

³⁰ Environmental Protection Department, "Sustainable Development Provides a Better Future Environment," Presentation made at a forum entitled Pursuing a Sustainable Future, January 2002.

³¹ Renewable energy, in its strictest term, does not include landfill gas and biogas from wastewater unless the waste is generated in a sustainable manner.

integrate wind power from regional sources.

3.2.1.4 Hong Kong is not only a green purchaser, but can also serve as a catalyst for the regional wind movement. With its leading legal and financial systems, Hong Kong can help attract international investors who often lack confidence in China's regulatory systems.

3.2.1.5 It has been argued that it is unrealistic to import renewable energy from Guangdong, as Guangdong should keep the renewable energy for areas with poor energy accessibility. However, shortage of electricity in some parts of Guangdong occurs in part because the Central Government has been restricting the building of conventional power plants due to pollution concerns, while imports of cleaner power from the Western provinces are delayed by transmission extensions.

Speeding up power capacity installation in Guangdong is a must. The key is whether it will be from the polluting conventional power, nuclear power, or from renewable energy such as wind power. Wind energy is particularly beneficial to Guangdong's recent energy situation as wind farms can be built quickly to respond to electricity shortages, often in as little as twelve months, assuming permits and resource assessments are complete.

3.2.1.6 Guangdong is rich in wind resources and has great potential to further develop its wind projects. It is high time for Hong Kong to consider our role in the regional development of wind energy.

3.2.2 OUTLYING ISLANDS

3.2.2.1 Wind turbines can be installed on outlying islands that possess rich wind resources, especially those off-grid such as Po Toi Island – the southernmost island in Hong Kong.

3.2.2.2 Hong Kong, situated at the southeastern tip of China, has a total land area of 1,100 km² and a total marine waters of 1,654 km². Hong Kong also possesses some 260 islands, each with an area greater than 500m²,³² that provide plenty of opportunities for setting up wind turbines.

3.2.2.3 Wind projects can offset diesel use on these islands, and are particularly beneficial if the wind energy system can be combined with the desalination system.

3.2.2.4 Many of the islands are popular places for day trips, hiking and water-sports. Wind turbines can be seen as an added value to local tourism.

3.3.3 COASTLINE AND OFFSHORE SITES

Hong Kong has long coastlines, including 463 km in Kowloon Peninsula and New Territories, and 715 km in Hong Kong Island, Lantau Island and other small islands. ³³ coastline and offshore sites possess Hong Kong's best wind resources that can provide the lowest cost wind power.

4. SUPPORTING APPROACHES FOR WIND DEVELOPMENT AROUND THE WORLD

4.1 Support for wind energy is currently needed because: (a) Conventional sources have unfair advantage because of subsidies; (b) Conventional sources incur minimal pollution charges; and (c) Initial capital investment is high because of the newness of the technology,

³² Marine Water Quality in Hong Kong 2001, Environmental Protection Department, 2002.

³³ Marine Water Quality in Hong Kong 2001, Environmental Protection Department, 2002.

but operational costs are significantly lower than conventional energy as wind energy requires no fuel and relative costs are expected to fall with widespread commercialisation.³⁴

4.2 International experience suggests that political support and financial incentives are the keys to jumpstart wind energy development. Over the past decade various approaches have been adopted around the world as illustrated below.

4.2.1 Renewable Portfolio Standard (RPS)

4.2.1.1 The RPS allows government to set minimum amounts of renewable power in the supply mix and the market determines the cheapest way to meet the demand.

4.2.1.2 The advantages of this market-based system as compared to other renewable energy supporting policies are: (a) It relies on the market instead of relying on government to distribute funds and (b) It forces renewable energy technologies to compete against each other to further drive down costs.

4.2.1.3 The government's role is limited to (a) Certifying the generation output of renewable energy producers and issuing the appropriate number of renewable energy credits and (b) Verifying that power suppliers possess the required number of credits at the end of each year.³⁵

4.2.1.4 The RPS is usually supported by a green credit system so that power suppliers can meet their renewable quota either by building green power facilities or by purchasing the equivalent green credits from another developer.

4.2.1.5 Many countries have already committed a target for the use of renewable energy sources as tabulated in Table 6.

Table 4.1: Policies and/or Statutory Requirements of Selected Countries on the Use of Non-fossil Fuel/Renewable Energy Sources

	Policies/Statutory Requirements
China	In 1995, the Central Government voiced new commitment to renewable energy, as outlined in the New and Renewable Energy Development Program, 1996-2010, which was developed by the State Economic and Trade Commission and the former State Planning Commission and State Science and Technology Commission. The project comprises the <i>installation of 190MW wind farms and 10 MW PV system from 1999 to 2004</i> , of which, Shanghai will install 20 MW wind turbines.
Republic of Korea	A target to supply 2% of total energy demand by new and renewable energy <i>by 2006</i> .
Australia	Set mandatory target of additional 2% of their power generation from renewable energy. This will move up the share of renewables to <i>11% by 2010</i> .
European Union	The Communication from the Commission entitled "Energy for the future: Renewable Energy Sources – White Paper for a Community Strategy and Action Plan (COM(97) 599 final)" and the European Council Resolution of 8 June 1998 on renewable sources of energy stipulate a target to double the share of renewable energies in gross domestic energy consumption across the EU from the present <i>6% to 12% on average by 2010</i> . All member states are required to set national (non-binding) targets for renewables to be consistent with the EU target.
United Kingdom	Under the U.K.'s Non-Fossil Fuel Obligation Orders, introduced in 1989, more than 2 % of its electricity (about 1,177 MW) must be generated from renewable sources. The U.K. aims to increase renewable output to <i>5 % by 2003 and 10% by 2010</i> under the EU

³⁴ "Renewable Portfolio Standard: A Tool for Environmental Policy in the Chinese Electricity Sector," Energy for Sustainable Development, Vol V No. 4, December 2001.

³⁵ Website of Wind Energy Action, retrieved July 2002, from http://www.windenergyaction.com/facts/RPS_Fact_Sheet.pdf.

	target. As part of its revised policy for renewable energy in the UK, the Government has introduced a new Renewables Obligation (RO) in 2000 to succeed the Non-Fossil Fuel Obligation (NFFO) and the RO has become the British government's main toll for achieving its target of 10% of UK electricity from renewables by 2010. ³⁶
Republic of Ireland	In 1996, 2% of power was from renewable energy. Share of renewable energy in total energy supply to be increased to 5% by 2010. Ireland would be required to generate 13.2% of electricity by renewables by 2010 under the EU target.
Denmark	20% of electricity consumption from renewable energy by 2003. Denmark would be required to generate 29% of electricity by renewables by 2010 under the EU target. Denmark has committed to use 1.4 million tones of biomass for production of electricity and heat, and install 750 MW offshore wind power capacity by 2005 and 2008, respectively.
The Netherlands	A target of 10% renewables in 2020. The Netherlands would be required to generate 12% of electricity by renewables by 2010 under the EU target.
United States	Non-hydro renewables and alternative energy currently account for 2% of electricity needs. Hydropower provides about 7% of electricity supply. <i>New York State</i> requires, through an executive order, the purchase of no less than 10% and 20% of the overall State facility energy requirements from renewables by 2005 and 2010, respectively.

(Source: EPD, 2002³⁷)

<p>Highlighted Case</p> <p>(a) China</p> <p>As discussed in the previous section, Guangdong has been seriously considering various support policies to boost wind energy development. One of those policies is the Mandatory Market Share (MMS) concept (), which is based on the same concept of the American Renewable Portfolio Standard.</p> <p>The MMS was included in China's Tenth Five-Year plan from 2001-2005.³⁸ It is a legally binding obligation on provinces to meet a renewable energy quota of certain percentage of total electricity production from their own generation or through the trade of green certificates.³⁹</p>

4.2.2 Renewable Energy Feed-in Tariffs (REFITS)

4.2.2.1 State-backed REFITS guarantee generators of renewable energy a fixed tariff over a set period. In Germany, renewable energy producers were guaranteed up to 90% of the domestic price of electricity for every kilowatt generated by a wind plant for 20 years under the 1991 Electricity Feed Law.

4.2.2.2 But some experience shows that REFITS have to work hand-in-hand with a raft of national and regional tax incentives, low-interest loans and grants as the REFITS might not be enough to support the investment of wind projects.

³⁶ Website of the Department of Trade and Industry, U.K., retrieved 2 December 2002, from <http://www.dti.gov.uk/renewable/nffo.html>.

³⁷ Environmental Protection Department, "Sustainable Development Provides a Better Future Environment," Paper presented at a forum entitled "Pursuing a Sustainable Future, 2002.

³⁸ "Renewable mandate in five year plan," *Windpower Monthly*, May 2001.

³⁹ "Renewable portfolio standard: a tool for environmental policy in the Chinese electricity sector," *Energy for Sustainable Development*, Vol V. No.4, December 2001.

Highlighted Cases

(a) China

A fixed payment scheme is also under State Development and Planning Commission. This concept would set the wind tariff for the first few thousand full load hours of each year based on the project's investment per kW and its allowable rate of return.

(b) Germany, Denmark and Spain

The REFIT support model has produced the most renewable energy capacity. In Germany, combined with assured grid connection, the REFIT attracts easy financing and therefore rapid development, allowing Germany to install 2,660 MW of wind in 2001 alone. In Denmark and Spain, the REFIT has established a healthy wind industry that makes the countries the major global exporters of wind technology for years.

4.2.3 System Benefit Charge (SBC)

4.2.3.1 The U.K. and some 14 states in the U.S. have collected clean energy funds for promoting renewable energy via the System Benefit Charge. This charge to all electricity customers, usually applied on a penny/cent per kilowatt-hour basis, allows a country or a state to fund renewable energy projects.

4.2.3.2 Different approaches have been adopted to spend the fund. In Massachusetts and Pennsylvania, for example, the fund provides low interest loans or equity investments for renewable energy companies. Others such as California and New York offer production incentives.

4.2.3.3 How to administer the fund also varies. State energy or environmental agencies run the funds in some cases but some states employ semi-private, independent organisations. Others, such as Pennsylvania, allow independent utilities to run the fund under the oversight of the state's public utilities commission.⁴⁰

Highlighted Case:

(a) California

California has used the Public Goods Charge, which is collected from ratepayers at the rate of US\$135 million each year, to offer production incentives to about 1300 MW of new renewables capacity, but by the end of 2001 only about 200 MW had come online. The thrust of the problem is that new renewable projects are not built without long-term contracts⁴¹. In addition, SBC without renewable energy market demand can stall development.

(b) United Kingdom

Funds were collected in the U.K. as a SBC levied on all power customers known as the "non-fossil fuel obligation (NFFO)." Most funds went to nuclear power, but a small number of renewable energy projects were supported by competing for the lowest subsidy in their technology class. However, this auction process seemed to show that a SBC distributed by auction could dramatically reduce the price of renewable power. Many wind power projects from NFFO got stuck in the planning process, because in order to bid for the lowest subsidy, they had to be located in the best wind sites, which were usually on scenic hilltops and therefore aroused strong objection from local residents and planning boards. It was also realised that by pushing wind power prices to rock-bottom, there would be no resources left to drive research and development efforts, which were essential to continue the development of more reliable and efficient wind turbines, thereby reducing wind power costs.

⁴⁰ "Sustainable energy: financing a green power revolution," *Environmental Finance*, July-August issue 2002.

⁴¹ "California Heads for Toughest Mandate Yet," *Windpower Monthly*, September 2002.

4.2.4 Production Tax Credit (PTC)

4.2.4.1 In the U.S., production tax credits or bonuses per unit of production have also been given to wind power on top of the market price for several years. Canada has just started a PTC at the federal level, while in Spain wind plant operators can choose between a fixed tariff (REFIT) or a production bonus on top of the power pool price.

4.2.4.2 The PTC strategy is only effective at creating a major wind market if the policy is kept in place for several years. When the American PTC enacted by the congressional tax committees expired in 2001, the cost to the industry was dramatic with some \$3 billion worth of projects put on hold.⁴²

4.2.5 OTHERS

4.2.5.1 Concession Model in China

Besides MMS and REFITS, the Concession Model () is another tool that China has been closely examining. Under the Concession Model, wind developers bid for projects of pre-determined scale and location. The model is expected to streamline the planning and application processes and drive down costs with economies of scale from large projects. However, the lack of clear legal enforcement of the contract and the inflexibility of pre-determined locations are concerns raised by some developers. Guangdong's second wind farm at Huilai is one potential concession area.

4.2.5.2 New Zealand

New Zealand is an excellent example to demonstrate that wind energy development can be sluggish even with great wind energy resources if there is no effective support policy.

New Zealand has average annual wind speeds of up to 9m/s. However, the development of wind energy has been hindered by the lack of political support because of (a) National focus on energy efficiency programmes that aim to reduce energy usage in the country by 20% and (b) The general public perception that the country's heavy reliance on hydropower means that the renewable energy resources are already suitably developed.⁴³

5. ACTION PLAN FOR HONG KONG

Hong Kong should adopt the following plan of action to allow wind energy to contribute substantially to the mainstream power production.

5.1 ESTABLISH RENEWABLE ENERGY POLICY AND TARGET

5.1.1 The HKSAR Government should commit to developing a specific policy to promote the wide-scale adoption of renewable energy resources and technologies.

5.1.2 In particular, Hong Kong power companies should be required to include a minimum amount of renewable energy in their resource portfolio. If the minimum amount is set at

⁴² Website of American Wind Energy Association, retrieved 3 Sep 2002, from http://www.windenergyaction.com/facts/PTC_Fact_Sheet.pdf.

⁴³ Vicki Hyde, "Great potential but no decent policy", Wind Power Monthly, Sep 2002.

5% of the existing power volume,⁴⁴ about 2 TWh electricity will be required from renewable energy. To generate the 2 TWh electricity, about 300 wind turbines with 900 MW generating capacity in total will be needed, assuming the 3 MW model—the highest-capacity model that is available in the commercial market—will be installed. And that would require an area of about 60km², about two-thirds of Hong Kong Island. At a glance, it may seem that a network of wind farms with 900MW generating capacity would not be easy to establish. However, it should be noted that wind farms have an outstanding characteristic – they are quick to be built. In Texas, about 900 MW of wind turbines – the same scale required by Hong Kong if 5% of its electricity is from wind energy – was built in one single year in 2001.

- 5.1.3 Presently the existing three wind farms in Guangdong have about 85 MW of operating capacity. While Guangdong has yet to develop into a mature wind market, Guangdong should have promising future for wide-scale wind development with its abundant wind resources, provided with the right regulatory systems and policy support. And Hong Kong should look beyond our border and take part in the regional development of wind energy.
- 5.1.4 When formulating the right combination of supporting policies for renewable energy in Hong Kong, the Government should take into account international experience as discussed in Section 4. Different approaches have met with success and failure in different places depending on the details of implementation. In addition, transparency in the decision-making process of energy issues should be vastly enhanced.

5.2 REPLACE THE EXISTING SCHEME OF CONTROL AGREEMENTS WITH A MORE SOCIALLY RESPONSIBLE POLICY

- 5.2.1 The present Scheme of Control Agreements (SCA's) between the Government and the two local power companies are disincentive to renewable energy development because:
 - (a) **False pricing.** The SCA's do not require power companies to take into account external costs of fossil fuels. In the absence of energy resources that take into account environmental concerns, it is evident that the power companies' shift in the use of different fuels depends on market prices of fuels, rather than environmental reasons. While coal-powered plants produce much more pollution, the use of coal for energy production has increased 40% in recent years. Between 1997 and 2001, production has risen from 5,711,456 tonnes to 8,033,097 tonnes, while the price of coal plummeted about 30% from HK\$269/tonne to HK\$195/tonne from 1997 to 2001.⁴⁵ As such, **full pricing** of fossil fuels is essential to provide a level playing field for renewable energy.
 - (b) **SCA's guarantee returns from fixed assets.** SCA's offer no financial incentives for power utilities to explore renewable.
 - (c) **No Interconnection.** SCA's have no requirement of interconnection of energy grids provided by CLP Power and HEC. Although CLP Power has been connected with the Guangdong power grid for decades, HEC has been isolated and is not able to reach renewable sources in Guangdong. In fact, the Government has long recognized the need for interconnection. It was clearly stated in June 2000 in a reply from the Economic Services Bureau to the Legislative Council that *"we see increased interconnection, not just between the two power companies but also with Mainland China, as*

⁴⁴ Census and Statistics Department, Hong Kong Energy Statistics, 2001 Annual Report, 2001. The total local consumption of electricity in 2001 was 37 TWh (Terawatt-hour).

⁴⁵ Census and Statistics Department, Hong Kong Energy Statistics 2001 Annual Report, 2001.

the logical way forward for the longer term.”

- 5.2.2 Hence, the existing SCA’s should be replaced by a more socially responsible policy, one that is not discriminatory to renewable energy. The interim review of the SCA’s next year will pave the road for the 2008 final review of the SCA’s. This is now the most opportune time to convene a renewable energy debate in order to ensure the post-2008 agreements will (a) Contain the necessary provisions to guarantee the power companies’ investment of renewable energy and (b) Secure full costing of fossil fuels, including environmental costs, in order to allow a sensible economic decision-making on energy choices.
- 5.2.3 **Avoid negative factors of deregulation.** Deregulation of the power market for open competition can destroy the goals of renewable energy and rational energy use (e.g., California). New profit incentives for the power companies to develop clean power sources will benefit Hong Kong far more than a simple competition policy.
- 5.3 ESTABLISH AN INDEPENDENT TRANSMISSION OPERATOR FOR NON-DISCRIMINATORY GRID ACCESS OF RENEWABLE ENERGY PROJECTS**
- 5.3.1 At present, there are no standardized application procedure and charging mechanisms for third-party access to the local grids. As such, all renewable energy projects applying for grid connection have to be scrutinized on a project-by-project basis by the two local power companies.
- 5.3.2 Grid connection is important for renewable projects because storage systems of energy are expensive and space consuming. They also incur energy loss during the energy conversion process. The utility grid therefore acts as a storage system.
- 5.3.3 The educational building-integrated photovoltaic (BIPV) project at Ma Wan Primary School is one of the very few renewable energy projects that have the experience of applying for grid connection. The case study below gives an account of the hurdles that have to be encountered by such a project under the present uncoordinated situation.

Table 5.1 Case Study of the Educational BIPV projects at Ma Wan Primary School

Case Study: BIPV Projects at Ma Wan Primary School

Project Brief:

The Department of Architecture of the University of Hong Kong has been awarded funds to integrate photovoltaic (PV) systems within the new Ma Wan Primary School on Ma Wan Island. The project concerns three small-scale installations of different PV technologies in different building integration. Operating in tandem with a Schools Building Energy Management System that is also included in the research project, the annual output has been simulated to vary between 12-17% of the total classroom energy use. The three technologies are:

1. CIS PV technology: installed on a deck-shading system with pre-fabricated trusses; about 28kW peak rated.
2. Amorphous silicon technology: rated at 7.5kW
3. Poly-crystalline cells: rated at 4kW

This HK\$5.81 million project is jointly funded by CLP Research Institute and the Government’s Innovation and Technology Fund. The project commenced in February 2001. Construction of the PV installations is scheduled to commence in about February 2003 with completion due in June 2003.

Charges required by CLP Power for Grid Connection :

- (a) **Application charge.** It is currently set at HK\$10,000 and is charged to cover CLP Power’s costs to set up and process the application.
- (b) **User pays charges.** The charges are to cover the technical assessment for facilitating the grid connection, and the cost of necessary works to facilitate grid connection of the PV installation,

e.g., meter and special cabling. (The charges are determined on a project-by-project basis as projects vary in terms of technical characteristics and size)⁴⁶.

- (c) **“Cross-subsidy mitigation” charges.** These charges are exempted for the Ma Wan project as it is classified as a “small green energy project.” In principle, the charges are to avoid the cross-subsidy of different customer groups. According to CLP Power’s policy, for small green energy projects, i.e., size of project does not exceed 200kW and given their benefit to society, the cross-subsidy charges can be exempted by applying the “No Losers” principle. Small Green Energy Projects will include technologies such as solar thermal energy, solar photovoltaic, wind energy, wave energy, and tidal power.

Total charges:

So far, the Ma Wan Primary School has been requested to pay the “application charge” of HK\$10,000 and will be requested to pay “user pays charges” but the amount is unknown yet.

5.3.4 Presently, the CLP Power has yet to produce clearly stated policy and application procedures for a renewable project to secure grid connection. On the other hand, its counterpart HEC is unable to provide any detail of its charging on such applications.

5.3.5 To date, HEC has been involved in one renewable project with grid connection—the pilot project of Wanchai Tower’s PV system. While HEC imposes no charge on the Wanchai Tower project, which is a government project for grid connection, the HEC spokesperson said that any application for grid connection of renewable project will be considered, although so far no other application of the same kind has been made.⁴⁷

5.3.6 The case study of Ma Wan Primary School has demonstrated the development of local renewable projects can be hampered in the following ways:

(a) **Charges are disincentive.** The charging discourages the development of renewable projects. Even though the “cross-subsidy mitigation” charges have been exempted, the HK\$10,000 application fee together with other administrative charged incurred by the utility could amount to a substantial portion—can be 10% or more—of the cost of the PV system, and therefore, prohibitive for educational programmes such as the Ma Wan Primary School and other small-scale installations of renewable systems.

(b) **The lack of standardized procedures.** The application procedures are time-consuming, with no standardized guidelines or procedures, which inevitably increase the cost and business risks of the renewable projects.

5.3.7 The utilities must stop discriminatory rules/behaviours against independent generators, including renewable projects. Equally important, the local power transmission system should be made independent of the two power utilities and be operated by an independent systems operator (ISO). The ISO, which has been commonly adopted over the world, will increase the transparency and efficiency of third-party access to the grid.

An ISO will also enable the local power companies to connect their customers to renewable energy projects beyond Hong Kong’s territory, e.g., from Guangdong.

5.4 PROVIDE CLEAR PLANNING GUIDELINES FOR WIND ENERGY IN HONG KONG

If there were no wind potential for a specific site, any incentive for helping wind energy development would not help. Wind energy monitoring should be carefully planned in order to demarcate Wind Development Zones in the region. Hence, a set of guidelines

⁴⁶ Josie Close, Department of Architecture, University of Hong Kong, personal communication with Friends of the Earth (HK), 2002.

⁴⁷ Personal communication between Friends of the Earth (HK) and HEC, 10 December 2002.

should be provided for any stakeholder who is interested in investing in wind energy development and be assisted in their decision making process in planning for the project.

For example:

- Preliminary area identification to search for a suitable wind resource based on the topography of the site, the climate or airport wind data;
- Wind resource monitoring to verify that the identified area has sufficient wind resource; and
- Micro-siting to quantify any variability over the specified terrain is vital to building a properly-placed wind energy plant.⁴⁸

A standardized environmental impact assessment process for local wind projects is also necessary to address various planning and siting issues, such as impact on birds, scenic value and fairways for ships.

5.5 SET UP A WELL-COORDINATED TASKFORCE IN THE GOVERNMENT FOR RENEWABLE ENERGY DEVELOPMENT

5.5.1 In comparison to other developed economies, Hong Kong lacks legislation, strategies, incentives and education on renewable energy. At present, responsibility for renewable energy policy resides with many different government departments, resulting in fragmented control and lack of leadership in energy planning. While there have been some initiatives for promoting renewable energy, they have been few in number and are voluntary in nature. As a result, Hong Kong has no renewable energy policy, and the Government has an unrealistic trust that the power companies will plan their profits and still look after the best interests of the consumer and the environment.

Table 5.2: HK Government's fragmented structure for renewable energy development/ policy

Department/Bureau	Responsibility	Actions
Economic Development and Labour Bureau (EDLB)	<ul style="list-style-type: none"> • Formulate and review energy policy • Initiate renewable energy study • Financial monitoring of electricity companies through Scheme of Control agreements with utilities • Review applications for new power stations • Member of Energy Advisory Committee 	<ul style="list-style-type: none"> • Joint sponsorship with the Environment, Transport and Works Bureau for a consultancy study on renewable energy. The study examines the potential applications of several types of renewable energy technologies in Hong Kong. The study will be released in 2003.
Environment, Transport and Works Bureau (ETWB)	<ul style="list-style-type: none"> • Formulate and review policies on increasing efficiency in energy consumption and monitor programme implementation • Member of Energy Advisory Committee 	<ul style="list-style-type: none"> • Joint sponsorship with EDLB for renewable energy consultancy study (see above)
Electrical and Mechanical Services Department - Energy Efficiency Office	<ul style="list-style-type: none"> • Monitor electricity supply companies under the Scheme of Control Agreements • Implement Energy Management programme • Conduct energy audits • Implement Building Energy Codes • Implement water-cooled air conditioning systems • Operate voluntary Energy Efficiency Labelling Scheme • Implement Demand Side Management programmes • Compile energy end-use data 	<ul style="list-style-type: none"> • Involved in the EDLB and ETWB-commissioned renewable energy consultancy study (see above)
Environmental Protection Department	<ul style="list-style-type: none"> • Compile Hong Kong air pollutants and greenhouse gases emission inventory • Develop initiatives concerning global warming and related energy matters • Promote environmental education and awareness through various programmes and campaigns • Member of Environmental Campaign Committee 	

⁴⁸ AWS Scientific, Inc., April 1997.

Hong Kong Observatory	<ul style="list-style-type: none"> • Operate a network of 67 automatic weather stations located at various places in Hong Kong and gather wind resources data. 	
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(Source: Hong Kong SAR Government Website)

The Task Force should integrate employment, externality costs of air quality, energy security into Hong Kong’s energy policy, and assist in the commercialisation of renewable energy.

5.5.2 In addition, the Task Force will have a significant role in promoting research and development of renewable energy technologies, including fuel cells. Fuel cell is a device that can combine hydrogen and oxygen in a chemical reaction process and produces electricity. Pure hydrogen-fed fuel cells produce only water--virtually no pollution.

Fuel cell and renewable energy are closely linked because hydrogen can be generated by using power from wind turbines or photovoltaics to electrolyse water into hydrogen and oxygen. The use of hydrogen allows easy exchange of energy between renewable energy, power plants, electricity storage, and transport fuel. Since fuel cells can be used as both stationary power producers in power plants and be used to power vehicles, its future development is destined to change the landscape of the energy and transport sectors.

5.6 COOPERATION WITH GUANGDONG ON POLICIES FOR WIND ENERGY DEVELOPMENT

A regional network of wind farms in Guangdong including Hong Kong should be established. As more wind farms are connected over a larger area, the wind pattern affecting each is different and the total variation of power output is reduced. The network can be established with the input from a higher level of initiatives from the HKSAR Government and the Guangdong Provincial Government.

END

List of Signatories of FoE's signatory petition for renewable energy launched between 2 February and 1 April 2003.

This statement

Friends of the Earth (HK) and the undersigned call on the HKSAR Administration to formulate a renewable energy policy which:

- 1. reflects the full costs (including health costs) of electricity generation;**
- 2. provides financial incentive for local power companies to invest in renewable projects;**
- 3. allows renewable energy sources, not only in Hong Kong but also from Guangdong, to enter Hong Kong's power grids.**

has been endorsed by the following organization and members of the public:

Organisation:	
Citizens Party	
Democratic Party	
Objection to Route 10 Action Group	
The Conservancy Association	
Vicmax Technology Ltd	
World Wide Fund For Nature Hong Kong	
Members of the Public:	
Chan, Corrin	Lam Ching Choi (Dr)
Chan, Susanna	Lam Kin Che (Prof)
Cheng M., Daniel	Lau, Patrick (Prof)
Cheung Ching Mui, Quidde	Lee Sau Mui
Cheung, Maria	Lo Chee Pui
Chi Wai Hui, David	Ma, Becky
Chin, Danny	Ma, Kalmond
Chu L. M.	Ooi Yew Chin
Doh Po Wan, Christina	Tien Hou Wah
Fong, Stephen	Tsoi Kwok Ho
Greg Pearce	Wong, Kenneth
Heyer, Daniel R.	Wong, Vivian
Ho Cheung Hung	Wu Hoi Yin
Kwok, Jackson	Young, Robert
Lai Yu Sum, Kevin	Yu Chai Mei, Jimmy (Dr)
Lam Chi Kwong, Angus	

Friends of the Earth (HK)



Signatory Petition for Renewable Energy

In response to the findings of the Hong Kong SAR Government's study on renewable energy

14 March 2003

Dear Friends:

If you look forward to cleaner air in Hong Kong, here comes an opportunity for you to shape public policy and to make it happen sooner! The HKSAR Government has just released a consultancy study on renewable energy this February and is now inviting public feedback until 6 April 2003.

Now is the time to state your views and voice your opinion. Do you think the renewable target proposed by the study is far too low? Do you consider incineration or other energy-from-waste technology as renewable energy sources? Do you think our existing energy market is holding back the development of renewables? There are lots of issues and perspectives that the government would like to gather from you before setting the target and time frame for introducing renewable energy to Hong Kong.

What can you do **NOW**?

Say what you'd like to say and what you have to say about renewable energy development in Hong Kong and

1. Join Friends of the Earth's Signatory Petition; or
2. Write individually to the Electrical and Mechanical Services Department (email: info@emsd.gov.hk; fax: 2890 6081) to tell them what you think. 6 April is the deadline!

The statement to be endorsed by you:

Friends of the Earth (HK) and the undersigned call on the HKSAR Administration to formulate a renewable energy policy which:

- 1. reflects the full costs (including health costs) of electricity generation;**
- 2. provides financial incentive for local power companies to invest in renewable projects;**
- 3. allows renewable energy sources, not only in Hong Kong but also from Guangdong, to enter Hong Kong's power grids.**

We value each and every signature. FoE (HK) is inviting all major stakeholders, including professional groups, academics, the private sector, legislators, green groups and individuals to join the signatory petition.

If you would like to endorse our petition for renewable energy,
please fill out the [online petition form](#) on our website
OR send the attached reply slip by e-mail (petition@foe.org.hk)
OR fax (2529.2777) to Friends of the Earth (Hong Kong)
by Tuesday, 1 April 2003.

Thank you for your support. Every single signature counts!

利振球助理署長：

香港使用可再生能源的可行性研究之建議書

本人十分贊同研究得出的結論：可再生能源可滿足香港長遠電力中一個不少的部份。在美國，「環保可再生能源」技術已有百多年的歷史，發展到現在經已十分成熟。在歐洲，有數個組織專門負責「環保可再生能源」的技術研究、建議及宣傳工作。加上地球污染日益嚴重，「環保可再生能源」無疑會成為世界的未來能源發展方向。沒有了大量污染氣體的香港才可提供一個舒適、健康、美麗的居住及營商環境。對外就能提升香港國際形象，以吸引大量專業人才來港及高增值行業的投資。對內可提升市民生活質素及減低對生態環境的破壞。

就研究報告的內容，我有以下建議：

① 落實推行初期宜主力鼓勵風力發電：集中鼓勵「風力發電」的投資。因為風力發電的成本最便宜，平均每0.2-0.354元的價錢與傳統化石燃料發電價格差不多。由於光伏系統的開發成本昂貴，每2-4.1/千瓦，比傳統發電貴10倍，相信會令投資者止步。廢物轉化能源由於並沒有在此次報告詳細交代，單憑其3%的潛在資源估計實難以考慮。除成本考慮外，「風力發電」有大量海外經驗可借鏡與技術支援，發展「風力發電」較可行及可靠。

② 減低本地阻力和吸引投資開發：

① 與本地兩間電力公司合作加快可再生能源研究步伐，研製出一套低成本的可再生能源技術；

(ii) 透過教育及宣傳及統計調查，以教育市民「環保再生能源」的重要性，及了解市民對環保再生能源的意見，幫助發展「環保能源市場」，吸引投資；

(iii) 為外來及本地投資者，提供優惠（例如地價及稅務）及放寬有關批核限制。又提供專家顧問及部份技術支援，以吸引投資開發。

③ 宜在各方面再作諮詢：研究報告僅調查商業成本及技術問題以評估到「可再生能源的可行性」，但並無在社會認受性、法律問題、文化影響、監管及環保問題作一詳細調查和諮詢。例如風車在近岸的海床上設置，會對近岸生態有什麼影響？在郊區設置大型風車，會否對郊區的雀鳥及樹木做成壞影響？中產市民及新界原居民對景觀及風水的考慮會怎樣影響到「可再生能源」的普及。這些問題得不到解答都不可制定一個完善的政策。在推行時才遇到這些未解決的問題，不但阻礙推行「環保可再生能源」的進度，還會浪費公共資源。

④ 贊成「123」目標：鑑於本研究所得出在太陽能(光伏)、風力發電、廢物轉化能源及燃料電池的潛在資源未有考慮到制度、商業及「社會上的阻力」，加上財赤可能致令「環保可再生能源」的政策步伐減慢，2012年可滿足1%的電力需求（以1999年為基準），2017年時是2%，2022年時是3%的目標。絕不屬過份保守。加上「可再生能源」

團體認為5%的目標實屬操之過急。

總括來說，本人建議推行初期主力鼓勵風力發電，減低本地阻力和吸引投資開發可再生能源技術及宜在非技術層面亦非商業成本外再作諮詢。本人亦贊成「123」目標。希望利署長能夠接納本人的建議，如有需要，本人的聯絡電話為：62921494，地址：沙田道風山曉翠山莊6座7B。
26913033

大專生李肇峰謹啟
(主修環境生命科學)

二零零三年四月六日

Comments and Views regarding the findings and recommendations of the Stage 1 Report of the "Study on the Potential Applications of Renewable Energy in Hong Kong"

Ir Dr Edward W.C. LO, BSc(Eng.), MPhil, PhD, CEng, MIEE, MHKIE, MIEEE
(Email: eewclo@polyu.edu.hk, Tel: 2766 6144, Fax: 2906 1930)
Assistant Professor, Dept. of Electrical Engineering
The Hong Kong Polytechnic University

6 April 2003

I welcome the initiatives of the HKSAR Government in developments of renewable energy (RE) sources, and appreciate the release of the study report on 6 February 2003. The followings are my personal comments and views regarding the findings and recommendations of the Stage 1 Report.

1. *A general comment* — Generally I agree with all the findings and recommendations of the Stage 1 Report. I regard the directions and the approaches given in the report are basically right. However, I would like to bring out a few specific comments in the following points.
2. *The target is a bit too low* — With all the reasons given in the report, I still regard the target (1% at 2012, 2% at 2017 and 3% 2022) is too low. 2012 is 9 years from now, and we expect only 1% of the electricity generated is from RE sources by that time. In fact, this target is on the low side as compared with the last row in Table 2 (“Summary of Projected Contribution from Local RE Sources”) on p.20 of the Stage 1 Study Executive Summary. I suggest the Government should at least review this target in the coming years, after the 2003 interim reviews of SCAs, are completed and incentive schemes & project funding mechanisms of RE are established.
3. *Grid access is a very key issue* — I strongly support the view that one of the key issues to be addressed is grid access. Unlike situations in overseas, to build cost effective renewable energy generators in Hong Kong, nearly all these generators have to be grid connected. Otherwise the capital costs will be too high and it will be very inconvenient in using the generators. In many countries over the world, the right of the grid access is an important step to encourage the adoption of large-scale renewable energy projects. Therefore, the HKSAR government really need to try every effort to establish this right of access on the power grid.
4. *RE schemes be included in the list of “green” features of buildings of Building Department (BD)* — I regard one of the very effective incentives for building developers to adopt RE schemes in their building projects is that all the RE schemes can be exempted from the Gross Floor Area (GFA) and SC (Site

Coverage) calculations (just see other “green” features in the list of the BD), or even some slight adjustments on the plot-ratios. This approach has no financial implication to HKSAR, and can be implemented very easy. The report did mention about this incentive in the body of the report, but it did not explicitly bring out in the Chapter of the Recommendations.

5. *Government’s influences in the creation of a RE market and RE industry* — As the report pointed out the HKSAR Government is the largest electricity energy purchasers in Hong Kong, hence the Government should make effective use of this to give a very strong influence on the creation of a RE market locally. Not only that, more local job opportunities should be generated due the creation process of the RE market, hence a local RE industry can also be created. Here *local* does not necessary mean Hong Kong only, it can be the Pearl River Delta region.

Please note that the above are my own personal views and comments, they do not represent, in any way, views and comments of my employer or any of my associated organisations.

If any further clarifications about my comments and views are needed from me, please contact me via channels list at the top of previous page.

EW C LO

Edward W.C. LO



香港機電工程師聯會
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Fax : (852) 2519 0298
E-mail : info@hkfemc.org
Web : www.hkfemc.org

Our Ref: FEMC-03-TEC-005

April 6, 2003.

Energy Efficiency Office
Electrical and Mechanical Services Dept.
11/F., 111 Leighton Road,
Caueway Bay,
Hong Kong.

Attn : Mr. K. M. Leung

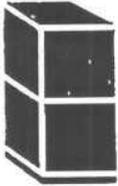
Dear Mr. Leung,

Study on the Potential Applications of Renewable Energy in Hong Kong

The Executive Summary of the Stage 1 Study has been distributed among our Constituent Associations and in summary we have the following views :

- We support Government to adopt a formal policy position with respect to renewable or alternative energy . The policy should be set with objectives to address long-term environmental impacts with due consideration on economy, safety, efficiency and reliability of RE sources taken into account. The affordability by public user will be a critical factor.
- From the Background and Policy Context of the Executive Summary, the use of RE which is more expensive than traditional fuel source is footing on the HKSAR 's commitment to " contribute to international efforts to reduce greenhouse gas emissions into the atmosphere and improve compliance with air quality objectives. " There are not sufficient backup data, as we see, provided in the Executive Summary to support the 1%, 2% and 3% target in this regard.

We believe the two power companies have to take an active role to invest in RE generation facilities, as prime RE developments will not be cost effective and we do not envisage it would attract serious investor to pump in huge capital cost. To attract corporations and realty developers to join the team of IPP, sufficient carrot incentive and/or tax benefits have to be provided, an adequately placed regulatory framework posting RE allowance for new developments could enhance RE development progress.



香港機電工程師聯會
The Hong Kong Federation of Electrical
and Mechanical Contractors Limited

Our Ref: FEMC-03-TEC-005

Date: April 6, 2003

We received comments that the PV system have relatively short lifespan and the maintenance cost is comparatively high, such comments have not been verified by us for its validity. However, under the current economic climate, Energy with additional premium and/or "Eco-Tax" will certainly generate heated response, we recommend further study on Environmental contribution from application of RE, relevant experience from developed countries and more detail financial analysis on application of RE in terms of their implication on electricity tariff rates, their cost effectiveness, life expectancy etc. be carried out to support the plan ahead.

Yours faithfully,
For and on behalf of
The Hong Kong Federation of Electrical & Mechanical Contractors Limited

T.L. Chau
Chairman
Technical and Legislation Committee

Energy Efficiency Office
Electrical and Mechanical Services Department
11/F., 111 Leighton Road
Causeway Bay
Hong Kong

5 April 2003

Fax: 2890 6081

Dear Sir,

**Study on the Potential Applications of Renewable Energy in Hong Kong
Public Consultation**

Civic Exchange, a non-profit public policy research organisation, would like to submit some brief comments on the above-captioned study.

Civic Exchange background

Civic Exchange recently co-organised a multi-stakeholder workshop on regulatory reform in the energy sector to determine the objectives of a regulatory framework for electricity supply that would be fair to consumers, producers and society. A common objective identified amongst different stakeholders was minimising the environmental impacts of electricity generation. Lack of incentives for alternative energy sources was also identified as a failing of the current regulatory/policy framework. Measures to address these failings were discussed at the workshop, and a copy of the discussion is appended to this letter.

Civic Exchange will also be publishing shortly a report on alternative options to the Scheme of Control which will also address the need to provide incentives for renewable energy (RE).

Targets for RE

While the EMSD study provides a good technical overview of the potential RE resources available locally, Civic Exchange considers it has taken an overly-conservative stance in its policy recommendations.

Civic Exchange agrees with the statements in Section 1.2 of the Executive Summary that increasing the proportion of renewable energy (RE) sources will minimise the environmental impact of energy production (in particular reducing greenhouse gas emissions and improving compliance with local air quality objectives) and increasing the security of Hong Kong's energy supply. While the study notes that Hong Kong has committed to meeting its greenhouse gas emission reduction obligations under the Kyoto Protocol, Civic Exchange wishes to point out that Hong Kong has yet to take any concrete action to implement the reductions.

Visit us at: www.civic-exchange.org

Civic Exchange also agrees with the RE strategy proposed in the study, namely:

- Build public understanding of, and support for, RE technologies;
- Align policies, institutional arrangements and technical standards relevant to RE so as to promote RE;
- Create a positive environment for investment in RE technologies; and
- Create a market in which RE can be sold to consumers.

In view of this and the myriad other benefits of RE technologies, including provision of local investment opportunities, one would expect that the consultants and the Government would strive for a more aggressive programme of developing RE in Hong Kong.

Therefore it is disappointing that the targets set for projected contributions from local RE sources are extremely low: namely 1% by 2012; 2% by 2017 and 3% by 2022 (this also includes contributions from waste to energy which may arguably not be classified as RE). Given the estimates of the very large potential of local RE resources, and in view of how RE can contribute to Hong Kong's energy policy objectives, it would seem prudent to adopt significantly higher targets. Instead, the consultants have adopted a do-minimum approach, which may be due to a marked lack of political will in overcoming some of the institutional/social and economic/financial factors.

In Section 4.5.2 of the Executive Summary the consultants justify the targets on the basis that “*equivalent environmental gains are likely to be achievable more cheaply by other means.*” Civic Exchange would like more information on what means the consultants refer to, what analysis has been done on the environmental gains, and what action is being taken by Government to facilitate such means.

Barriers to RE

Section 3 of the Executive Summary provides a good analysis of the issues preventing further and more rapid uptake of RE in Hong Kong, namely lack of grid access and the fact that the pricing of conventional power does not take into account environmental externalities which makes conventional power *appear* the least cost option, where this may not actually be the case. Environmental externalities need to be factored into the cost of energy production – renewable or conventional – and the current review of the Scheme of Control Agreements (SCA) with the two electricity companies should address the current requirement to supply power at the lowest cost.

Grid Access

In relation to the issue of grid access, Civic Exchange agrees that this is a key barrier preventing uptake of RE in Hong Kong. Civic Exchange therefore supports the recommendations in Section 4.2.1 of the Executive Summary for the Government to maintain a level playing field for the electricity supply sector if grid owners have to allow third party access to the grid; to facilitate development of technical and safety standards for grid access; to remove technical and institutional barriers to facilitate RE projects accessing the grid and to encourage full transparency in charging by the power companies.

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The study further recommends that the 2003 Interim Review of the SCAs provides an opportunity for the Government to discuss with the two power companies the question of RE development. Civic Exchange believes that this debate should be conducted publically with a wide range of stakeholders to avoid any possible conflict of interest. Further, all the possible options for reviewing the SCA and their environmental, social and economic implications should be presented to the public for discussion.

Market Creation

Three options for financial instruments are provided in the Section 4.2.2 of the Executive Summary to encourage participation of the two existing power companies in the RE market and to provide an intermediary market for future Independent Power Producers. More detail is required on how these schemes will work and the possible economic, environmental and social implications of the schemes, before Civic Exchange can form a view on which of these is preferred.

Need to encourage distributed generation

The paper does not emphasize the importance of encouraging distributed generation, a key factor in facilitating RE resources. For example, some RE resources, such as Building-Integrated-Photo-Voltaic (BIPV) systems or fuel cells, could generate excess electricity which could be sold back into the grid ('net metering'). This becomes more useful if there is real time pricing as solar power may coincide with peak electricity usage.

While the study discusses the potential for BIPV to lower the 'net energy needs' of the building, a more accurate characterization would be that PV panels would reduce the demand on the grid from the particular building, thus lowering the need for reserve capacity.

We hope that these comments will be taken on board by the relevant departments and bureaux, and that the Government will consider a more aggressive programme to develop RE resources in Hong Kong, in view of the numerous societal benefits.

Thank you

Yours faithfully,

Lisa Hopkinson
Head of Research

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**Comments and Suggestion by Ove Arup & Partners Hong Kong Ltd. on
EMSD Stage 1 Study on the Potential Applications of Renewable Energy in Hong Kong**

Comments

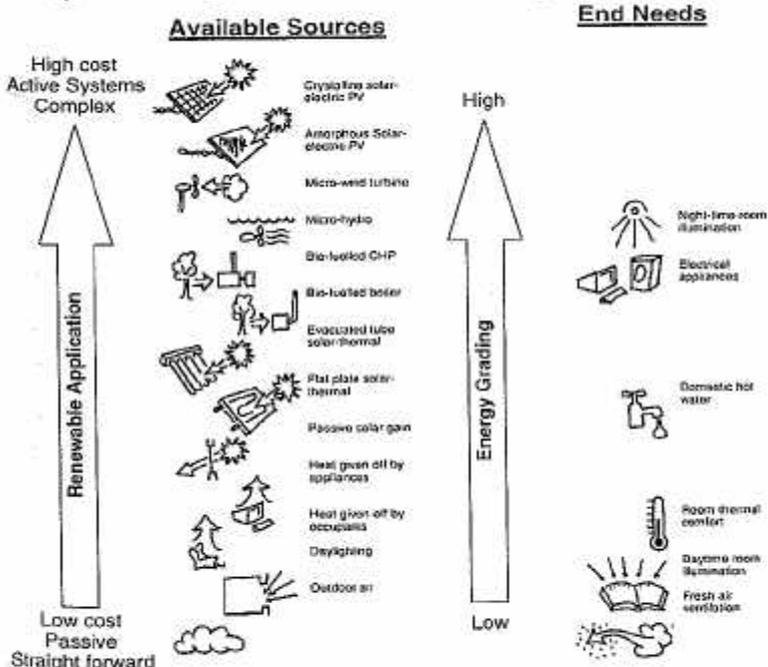
1. The policies of 'reduce greenhouse gases emission' will reduce reliance on imported energy or fuel, and increase the security of energy supply' as mentioned in the Section 1.2 of the executive summary of the study are supported.
2. Eco-tax could be a good measure to raise the environmental awareness of the general public. It can also increase the government revenue for environmental protection related expenses. Further input from the economist on this issue would be an advantage. However, many political and institutional difficulties may be encountered which can be exemplified by the long-term debate of such tax in the European Union.
3. The commercial viability of different types of RE use was evaluated in the study by the generation cost only, which is considered as incomprehensive. The initial investment cost, operating and management cost as well as the environmental cost should also be addressed.
4. The review result of the 2003 SCA Interim Review will be critical to the success of wider application of renewable energy in Hong Kong. The projected contributions from local RE sources as described in the Table 2 is entirely subject to success of the interim review, contribution and attitude of the two power companies as well as the proactive institutional policies in promoting RE applications. Owing to the existing SCA between the government and power utilities companies, large scale RE pilot scheme for BIPV and other renewable / new energy methods may be restricted.
5. According to the study report, off-shore wind turbine is considered as the appropriate large scale application in Hong Kong in terms of technical and financial aspects. The current Marine Park areas are confined in certain areas only, which accounted for a small portion of feasible marine wind farm within HKSAR boundary. Social acceptability of using off-shore wind turbine, such as visual acceptability, could be resolved by early and positive environmental education in the community.
6. The example in Section 2.3.4.1 of the executive summary regarding the potential power generation by the Individual Urban Wind Turbines is considered as ambiguous and could be misleading. Off-shore wind turbine system is technically sound and feasible but the application is restricted by the current institutional situation. Individual Urban Wind Turbines to generate electricity for individual building use may not conflict the current SCA and HEC / CLP Supply Rule. Unfortunately, Individual Urban Wind Turbine can induce many environmental and technical problems, such as noise and electromagnetic interference that have not been addressed sufficiently in the executive summary.
7. Possible incentives from the Government in promoting RE applications to the developers have not been addressed.
8. Targets - The proposed targets of local RE contribution to annual power demand for the various stages in the next 15 years may seem modest in the light of the types and estimates of the potential local RE resources.
9. Impact of availability and reliability of RE to the total supply demand has not been addressed adequately.

Suggestions

10. Stage 2 of the study should not be confined to Building Integrated Photovoltaic Pilot Scheme only. Individual urban wind turbine, building integrated fuel cell or energy-from-waste should also be included in the Stage 2 Pilot Scheme.

- Supply and demand - Has the report addressed the issues relating to Supply and Demand? Supply and demand is a multi-dimensional issue which resolves around the application for which the energy is needed and the time when it is needed. The diagram below outlines an evaluation of the appropriate technologies for different energy needs. Energy needs should be matched against the lowest possible grades of renewable energy for the cost effective application of renewable energy.

Engineering Renewable Energy



Engineering renewable energy (Arup Sustainability)

- Distribution and storage - If a large percentage of RE is generated at a time when it is least needed, and then it needs to be stored for later use. The expense on terms of capital outlay and the space requirement for battery installations is usually prohibitive on a wider use and it is quite obvious that putting excess electricity back into the grid is a reasonable strategy. However, the access of RE schemes by 3rd party to the existing electricity grid has been addressed sufficiently in the executive summary and clear direction is still lacking.
- It appears that the study only focuses on potential applications of RE in Hong Kong. Should environmental friendly transportation also be considered as transportation accounts for over 38% of the total energy use in Hong Kong?

Support

- A series of education programmes is recommended to educate the general public for how RE is important to us.
- Create a business environment for the local renewable energy related companies can help to wider the applications of RE in Hong Kong.

The Stage 1 Report of the "Study on the Potential Applications of Renewable Energy in Hong Kong"
Comments of the Institute of Energy (HK Branch)

1. Benefits of using renewable energy resources

Although the executive summary of the report seems to be rather comprehensive, the report fails to indicate the real benefits that can bring to Hong Kong with the use of renewable energy. In particular, it is useful to know how much it can reduce the overall toxic emissions by substituting the conventional fuels for electricity generation with renewable energy. This is important for determining whether or not any related cost of renewable energy is worthwhile.

We opine that there are a lot of benefits that renewable energy can bring to Hong Kong some of these benefits are listed below:

(a) Tackle environmental challenges

(i) Local and regional air pollution

Renewable energy resources, such as wind and solar radiation, cause virtually no emissions. They help alleviate our air pollution problems by reducing a great amount of pollutants, such as SO₂, NO_x, CO, particulates etc.

Consuming less fossil fuel can also help to reduce the urban heat island effect that aggravates our air pollution by increasing photochemical reactions at higher temperature. According to the Heat Island Group of the Lawrence Berkeley National Laboratory¹, for every degree Fahrenheit (0.56°C) increase in temperature above 70°F (21°C), the incidence of smog increases by 3%.

(ii) Global issue

The use of renewable energy helps to reduce greenhouse gas (CO₂) emissions. An aggressive renewable energy policy will, therefore, not only help to promote our international image and environmental leadership, but there are actually real causes for it as we are vulnerable to rise of sea level and increase of occurrence of typhoons.

(b) Encourage development of new technologies

To avoid being lagged behind, we should keep pace with the international development. It also helps our entrepreneurs to introduce new technologies to Hong Kong and our neighbouring cities.

(c) Create new jobs

Unlike conventional power generation, renewable energy is more labour intensive. It is estimated that every megawatt (MW) of installed wind capacity creates about 60 person years of employment and 15-19 jobs^{2,3}.

(d) **Boost economy**

The American Wind Energy Association estimates that for every MW of wind power produced, US\$1 million in economic development is generated².

As wind energy has very low operating cost, it helps stabilise the future electricity costs that are essential for maintaining our edges as a service/financial centre.

2. Target of renewable energy usage

The proposed targets (i.e. 1%, 2% and 3% of 1999 consumption in 2012, 2017, 2022, respectively) are far too conservative as compared to those of other countries (e.g. EU's and Australian targets of renewable energy output are 12% by 2010). These targets will not help the advancement of renewable energy technologies in Hong Kong.

While we appreciate that the study team has taken into consideration of the constraints and barrier to settle on recommending modest targets, the lack of a definitive drive means that HK can only be a follower in the use of renewable energy and in the development of the associated industries. A more positive signal (i.e. higher levels of target) is necessary to enable HK to capture the renewable energy opportunities.

We opine that a renewable energy target of not less than 2% of the annual electricity demand in 2010 or earlier is feasible even discounting those to be generated by wastes (i.e. landfill gas utilization and the proposed waste-to-energy facilities).

3. Recommendations

(a) **Early preparation for wind power utilization**

Among all other renewable energy resources, wind power is a much more mature technology that is ready for application in Hong Kong. In fact, the growth of wind power is much faster than any other forms of renewable energy. In 2002, the wind power capacity has increased by 28% worldwide driving total wind power installation to 31,128 MW⁴. Wind power should therefore be given higher priority since other renewable energy resources/technologies in Hong Kong are either limited (e.g. small hydro, geothermal) or too expensive (e.g. solar). In fact, Guangdong has already set up 67.5 MW wind turbine units in Shanwei and Nan'ao and planned to have 300 MW units by 2005. It would be possible and desirable for Hong Kong to request our power companies to either generate or purchase from Guangdong a certain percentage of this renewable 'electricity' to meet 1% or more of local consumption starting from 2008 onwards. It is a golden opportunity for Hong Kong to invest and collaborate with our neighbours. According to the estimate, Guangdong would have about 7,500 MW – 10,000 MW exploitable wind power⁵.

We can also build our own wind farms. It takes very low lead-time (about 2 years or so) for erecting wind turbines. Priority should be given to wind power in view of its competitive cost with the conventional ones and technical maturity. We can make use of the coming 3 or 4 years for setting up large scale wind farms so that electricity from wind for supplying about 1% of the demand can be made available as soon as the Schemes of Control Agreement expire in 2008.

(b) A broader perspective

The application of renewable energy in HK needs to take a broader view; as briefly touched upon in the Report, renewable energy can be produced elsewhere to support HK's need. To have a more speedy achievement of a more aggressive target, we should not only explore our own indigenous resources, but also collaborate with our neighbours, in a very similar way as we did for the nuclear power and pumped storage power station. To make it commercially viable, the energy market needs to be enlarged by encompassing the nearby regions; this applies to both the supply side and demand side.

We support the recommendation that the Government should consider commissioning a study to identify possible sites for wind projects. Again, the sites should not be limited to HK. The possibility of establishing a collaborative relationship between the HKSAR Government and other nearby regional governments to identify potential wind project sites should be explored.

(c) Fostering development of renewable energy industry

Renewable energy, as highlighted in the Report, has a potential to cater for a substantial fraction of the energy consumption in HK. Renewable energy related industries are expected to grow, not only within HK but also in the nearby regions and all over the world. For HK to benefit from this growing business opportunity, the Government should leverage the opportunity "to contribute to international efforts to stabilise greenhouse gas contribution in the atmosphere" to foster the development of renewable energy related industry in HK.

One possible approach in the near term is to fund research/pilot projects carried out by local companies and universities. The funding support helps reduce initial investment and, thus, makes renewable energy production more commercially attractive and competitive with conventional fossil fuel power generation. This could be in the form of R&D and deployment support (such as ITC funds) specially tailored to support local technology transfer and engineering development. The 'subsidise' therefore serves both as promoting the use of renewable energy and as investing in the development of local industry.

References

- [1] <http://eetd.lbl.gov/ea/heatisland/AirQuality/>
- [2] <http://www.ewea.org>
- [3] <http://www.windenergyaction.com>
- [4] *European Wind Energy Association and Greenpeace, "Wind Force 12 – A Blueprint to Achieve 12% of the World's Electricity from Wind Power by 2020"*
- [5] *Zhi Shiqun and Qian Guangming, "The Analysis and Calculation of Wind Energy on the Coastland of Guangdong", Meteorology (氣象), Vol 27(5), p.43-46, 2002.*

Comments from ASHRAE Hong Kong Chapter on Executive Summary on the Potential Applications of Renewable Energy (RE) in HK

1. In general, this executive summary very briefly discusses the future usage of REs, there is no life cycle cost analysis nor the schedule of any pilot projects for each mentioned potential RE to be launched in HK.

On the other hand, the paper gives us some directional indications for a number of potential wide scale application of RE, and estimate the possible quantities of these types of RE used in the coming 10 to 20 years.

2. It has mentioned that there will be having 'Eco-Tax' charge to us in the future, but without mentioned its estimated amount of this type of TAX? That is a key figure to assess the incentive of shifting to another REs, or simply passing the Eco-Tax to the consumer and retain the fossil fuel power generation.
3. For item 4.5.2 "Proposed Targets" table 2, the targets of adopting all REs, is only 1.9% to 4.3% of total electricity consumption of 1999, after 20 years from now. This is a very small amount and far from the objective of building up an environmental friendly image for HK.
4. Besides, we noted that the amount of REs, in percentage, is even smaller than 4% in many developed countries. Hence, we need to think about it seriously that are such REs too expensive to be adopted? Or it is not yet technically mature and still waiting for some new technologies or innovative methods to help us to utilize these REs, in a more economical or practical ways?
5. All these ER systems has been designed and implemented in some developed countries for many years, but up till now, they still cannot be widely used in the commercial sector. We believe the main obstacle is the high first costs. From the

paper, the estimated costs of each potential RE, most of them are 10 times higher than the conventional fossil fuel generated energy except Wind Energy.

Hence, our questions are:

- a. How to motivate the commercial sector adopting these systems?
- b. How to have a more perfect competition markets for selling power, which can encourage parties/corporations, other the two power companies to enter the electricity grid of HK.

In item 4.2.2 'Market Creation and Power Prices', it lists 3 options for the alternative of financial instruments to encourage participation of the two existing power companies in the RE market. We believe that is the key of success for promoting the implementation of REs in HK. On the other hand, it is a very complicated issue and needing our Government to take the leading role to discuss with different relevant parties in the near future.

In conclusion, we are looking for a more detail discussion for REs in both technical and commercial aspects in Stage 2 Study of Executive Summary.

The Hongkong Electric Co Ltd

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Please address correspondence to
PO Box 915, GPO Hong Kong

OUR REF: D,P&IT/320/00/02

4th April 2003

Energy Efficiency Office,
Electrical and Mechanical Services Department,
11/F., 111 Leighton Road,
Causeway Bay,
Hong Kong.

Dear Sirs,

THE STAGE 1 REPORT OF THE "STUDY ON THE POTENTIAL APPLICATIONS OF RENEWABLE ENERGY IN HONG KONG"

Reference is made to the captioned report. In response to your request for comments published on your web site, we provide the following comments for your consideration.

1. In paragraph 1.1 of Executive Summary, it was stated that all new power plants commissioned in Hong Kong since 1996 have been using natural gas as fuel. Please note that our Lamma unit L8 was commissioned in late 1997 which is coal fired. Planning for the construction of this unit was earlier than 1996. Hence please consider changing the wording to "all new power plants planned after 1996 in Hong Kong have been using natural gas as fuel."
2. The identified potential for wind energy for the three categories, i.e. rural wind farms in linear arrangement, near-shore marine wind farms, and individual urban wind turbines are very much over estimated. Instead of presenting a theoretical limit, the consultant should work out achievable potentials before working out the targets for 2012, 2017 and 2022.
3. The cost for wind energy is significantly lower than what has been suggested by PRC experts planning to build wind farms in China. Please ask your consultants to double check their assumptions used to derive these figures.
4. Building integrated Fuel Cells should not be included in this report. The primary fuel used by fuel cells is hydrogen which has to be derived from either processing of fossil fuel or electrolysis of water using electricity. If the electricity used to produce hydrogen were derived from renewable energy, counting fuel cells would be double counting the total capacity of renewable energy. If a fuel processing plant is incorporated into the fuel cell, it is not renewable energy. Fuel cells can at best be considered as a new energy source. However, it has the following drawbacks:
 - a. Fuel cells are not as efficient as latest technology combined cycle plants if used for electricity generation alone.

/To be continued

- 2 -

- b. The plants occupy larger space compared with electricity distribution facilities.
- c. Waste heat from fuel cells, if not probably managed, would cause local environmental impact.

We trust that you will carefully consider the above points and we look forward to your publication of the phase 2 report. If you have any queries on this matter please contact the undersigned.

Yours faithfully,
THE HONGKONG ELECTRIC CO. LTD.,
香港電燈有限公司



G. Chang
GENERAL MANAGER (DEVELOPMENT & PLANNING)

BY FAX & POST

Our Ref CSPD/230.12/L/25231/03-03/SHC/SL
Your Ref EEO/RE/07/10

中華電力
CLP Power



4 April, 2003

Mr. K.M. Leung
Electrical & Mechanical Services Department
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Dear Mr. Leung,

Study on the Potential Applications of Renewable Energy (RE) in Hong Kong

Thank you for your letter of 11 March 2002 to our Managing Director regarding the above.

The focus of the study is to suggest a policy position with respect to renewable or alternative energy. We believe this, in general, is the right direction. We also wish to emphasize that RE policy must be carefully crafted so as not to compromise supply reliability.

It is preferable for Hong Kong to focus on its own local application of RE technologies instead of introducing RE from the Mainland. Guangdong is short of electricity supply and its demand is growing rapidly. Given this and the potential problem in maintaining grid operation to the same standard, Hong Kong should not rely on the import of renewable energy developed in the Mainland.

CLP Power is open to commercially viable green initiatives in power generation. We keep ourselves abreast of new and green technologies and have been active in supporting various experimental renewable energy projects. We believe that the environmental benefits of any such initiative must be carefully weighed against the overall costs of electricity generation, which will eventually impact on users.

On the issue of grid connection, you may be aware that some progress has been made since the time of the Stage 1 Study. In February 2002, CLP Power had initiated discussion with the Economic Development and Labour Bureau and obtained the latter's agreement to a set of principles and guidelines for grid connection. Since then, more than a dozen applications, including some photovoltaic projects, have been processed by us.

We have noted that the definition of RE in the Study is wider than the standard definition adopted by the International Energy Agency, which excludes fuel cells and waste energy.

Cont. Page 2 of 2

Our ref: CSPD/230.12/L/25231/03-03/SHC/SL



We continue to keep an open mind on the future application of renewable energy to meet community needs. However such projects should be economically justifiable and socially beneficial without having one group of customers subsidizing another. Should Government determine to introduce RE on a compulsory basis, such plans and targets should be assessed in consultation with the industry to ensure that both the magnitude and the implementation mechanism are deemed realistic and beneficial to the whole community.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'S.H. Chan'.

S.H. Chan
Planning Director, CLP Power

sl:dl



The HK PV Consortium

Our ref.: HK PV Consortium/RE.StudyResponse/4 April 2003

Date: 4 April 2003

Fax: (852) 2890 6081

Email: renergy@emsd.gov.hk

Energy Efficiency Office,
Electrical and Mechanical Service Department,
11/F., 111 Leighton Road
Causeway Bay
Hong Kong

Dear Sirs,

Study on the Potential applications of Renewable Energy in HK

On behalf of the HK Photovoltaic Consortium (HKPVC) I am pleased to offer in the attached document, the considered response of the Members and Steering Committee to the Executive Summary Report of the above captioned Study.

The HK PV Consortium welcomes the opportunity to comment and strongly urges the HK Government to liaise with its relevant departments and bureaux to consider a more aggressive framework for developing distributed generation including renewable energy resources in Hong Kong.

Yours sincerely,

Josie Close
Chairman, HK PV Consortium

Enclosure: RE Study: HK PV Consortium Response 4 April 2003

Study on the Potential Applications of Renewable Energy in HK (Executive Summary Report – Final Preview – released 6 February 2003)

The HK PV Consortium welcomes the HK Government's release on 6 February 2003 of the Executive Summary Report and has the following comments:

1. Government prime energy purchaser:

The main value of the study released - Executive Summary: Study on the Potential Applications of Renewable Energy (RE) in HK - is the identification of the issues and barriers to the effective introduction of RE to Hong Kong. Importantly, the Summary highlights the Government's powerful position as HK's largest energy purchaser thus clearly positioning the Government's ability to influence directly the creation of the local RE market.

2. Insubstantial assessment:

Analysis of the local RE resource, as identified in the Summary, is simplistic and lacks credibility undermining claims for high potential. The strategies lack convincing detailed specific actions to support an RE energy resource build-up. It is therefore not surprising that the overall targets are cautious, as there is no substance (in the Summary) on which to base credible figures. Application of distributed generation to the urban context is the focus of the study but in assessing the solar energy there is no reference to HK's high density, high-rise characteristics and the losses from overshadowing and non-optimised PV arrays. There is no reference to changing climate/solar energy patterns that have an impact on the solar resource and PV yield.

3. Balanced resource:

The Summary lacks an overview of the total energy resource and its balance through different time scenarios over the next twenty years. Some RE resources are intermittent, yet it is important in promoting a progressive percentage build-up of the electricity supply that there is a balance from both steady and intermittent resources. In this respect, emerging technologies with steady energy potential merit greater attention. Nor is storage discussed though the partnership of solar energy technologies with hydrogen for fuel cell applications requires consideration with proper reference to the likely timeframe for the technology and costs to be effective.

4. PV rollout:

We draw attention to the importance of legislation to create a "level playing field". The USA 1978 Public Utilities Regulatory Policies Act (PURPA) legislation ensured that independent power producers be supplied with back-up power and their excess power bought at reasonable rates. Subsequently PURPA has been duplicated in other countries such as the German 1991 "Stromeinspeisungsgesetz". European experience, particularly the German RE Law of April 2000, indicates the effect that strong legislation has on confirming the market. Laws provide the validity for industry expansion, security for investment and local commercialization. In these very important aspects we consider the Summary has failed to provide a real and detailed policy framework. There is no shortage of tried and tested programmes as well as fiscal tools from which to take examples and evidence. New fiscal tools – including emissions trading - and voluntary assessment schemes - such as HK BEAM – are evolving through private sector initiatives and require support and endorsement at government level.

5. Regional market:

The PV industry is mature with greater product choice as well as standards and certification procedures in effect. International research continues but robust private investment on mass-production techniques to lower product costs is significant. The Summary does not reflect these recent advances nor the considerable market that HK within the Pearl River Delta/China offers for local mass production/assembly resulting in major cost reductions.

The HK PV Consortium is the initiative of individuals from business, industry and academia to promote PV applications in HK and the region. Through our work on PV in demonstration and education projects we are raising the community awareness and contributing to the increasing knowledge of local PV applications. We welcome the endorsement this Report gives for RE applications in HK while challenging some of the details of the study.

If you would like to know more about the HK PV Consortium and our work please e-mail hkpvconsortium@arch.hku.hk

end

D://HKPVConsortium/Govt.Study/EMSD.response 4.4.03

VIA FAX: 2890 6081

(7 pages inc. this one)

4th April 2003

Mr. LEUNG Kin-man
Electrical and Mechanical Services Department
11/F., 111 Leighton Road,
Causeway Bay, Hong Kong

Dear Mr. Leung,

Study on the Potential Applications of Renewable Energy in Hong Kong

Thank you for giving Greenpeace the opportunity to comment on the above study. The following is our response.

As we have noted in our recommendation, we believe that urgent action is required to put in place an enabling framework for renewable energy in Hong Kong. Greenpeace is very willing to be involved in this process.

Please do not hesitate to contact us if you need clarification on our response or require further information from us.

Yours sincerely

Martin Baker
Apple Chan



EMSD COMMISSIONED "STUDY ON THE POTENTIAL APPLICATIONS OF RENEWABLE ENERGY IN HONG KONG"

GREENPEACE RESPONSE April 4th, 2003

Introduction

People, environmental groups and governments worldwide have made great efforts to stop global warming and its potential disastrous effects on our climate, such as droughts and floods, disruption of water supplies, melting Polar regions, rising sea levels, loss of coral reefs, etc.

Climate change caused by burning fossil fuels because of our heavy reliance on oil, coal and gas, has caused the international community to become increasingly alarmed and to start to address the causes. Numerous international conferences have been held between scientists, environmentalists and government officials, trying to agree on steps to reduce emissions of greenhouse gases, and develop renewable energy. Different international conventions and agreements such as the Kyoto Protocol have been signed and ratified by governments.

Hong Kong, in its aspiration to be "Asia's World City", needs to realise the importance of "sustainability", and should immediately take steps to undertake its international responsibility to control greenhouse gas emissions and develop a comprehensive long-term energy policy. The policy should facilitate the development of renewable energy in Hong Kong and improve air quality by minimising carbon dioxide emissions.

Greenpeace welcomes the step taken by the EMS Department in this direction by commissioning consultants CDM to undertake the "Study on the potential applications of renewable energy in Hong Kong". Whilst welcoming the Study, it demonstrates how 'late to the game' the Hong Kong government is, how much ground needs to be made up and that urgent action is required. The CLP/HKE power company monopoly was negotiated 6 years ago, with no mention of renewable energy. The Study wasn't commissioned until Nov 2000 and it took 2 years to publish the report.

It is very disappointing, but not surprising that the proposed renewable energy targets identified in the Study were just 1% by 2012, 2% by 2017 and 3% by 2022. These targets are pitiful when compared to the targets set by the international community (see Annex), both in developed and developing countries. Even more disappointing is that the consultants identify the majority of the 1% target for 2012 as coming from "waste to energy" (WTE) facilities. Greenpeace would like to point out that a WTE incinerator could never be considered as renewable energy, it is even not considered as a sustainable solution to the waste problem.

Enabling framework for renewable energy in Hong Kong urgently required

It is Greenpeace's view that the renewable energy target identified in the Study is so pitifully low (1% by 2012) due to Hong Kong's restrictive, monopolistic energy market. The consultants commissioned to undertake the Study identified such a low target because (as they note) there are many non-technical barriers to the introduction of renewable energy in Hong Kong.

The current situation is that the power companies have a virtual monopoly and their main responsibility is to provide good returns for their shareholders. In other words, to preserve the status quo and not to allow the level of investment in renewable energy that is required.

The government needs to show leadership by creating the regulatory and investment framework to give renewable energy suppliers at least the same, if not more, advantages as the fossil fuel and nuclear power suppliers have enjoyed for decades.

The study suggests that there is good potential for renewable energy from taking a regional approach e.g. allowing Guangdong wind energy onto the Hong Kong power grid. The government should consider this in their negotiations with CLP and HKE, and address regional grid access issues for renewable energy.

The government needs to show and demonstrate real leadership – there has been none so far. The government is waiting for other interest groups to respond and will then formulate its own policy. This is not a sign of a government who seriously wants to take the lead on the introduction of renewable energy to the Hong Kong market.

The government has the chance to show leadership now with the onset of the mid-contract negotiations with CLP/HKE. The government should create the framework for the switching of investment from fossil fuels/nuclear to renewable energy sources immediately. Many with vested interests in the energy industry say that renewable energy is not viable. It is not viable because it has not enjoyed the massive subsidies that dirty, unsustainable energy has. The government needs to help incentivise energy from renewable sources.

The Study states two objectives 1. Ensure that the energy needs of community are met safely, efficiently and at reasonable prices 2. Minimise environmental impact.

The government may have considered adding a third: security of energy supply. With the right kind of investment and with the government setting clear leadership, Hong Kong could be more in control of its energy supply and not have to rely so much on imported energy sources. Security of supply must be the long-term objective and proper investment in renewable energy now would realise this objective.

Waste To Energy

The Study does not strongly recommend Waste to Energy through incineration. Waste to Energy through incineration is both damaging to the environment and human health (releasing greenhouse gases and poisonous dioxins) - it is also uneconomic. The government should show real leadership and back up its stated intent to support renewable energy with real action. WTE should not even be considered, instead the government should invest its efforts in creating the market for renewable energy.

In the meeting of Legco's Environmental Affairs Panel on 14 January 2003, Secretary for Environment, Transport and Works Bureau Dr. Sarah Liao clarified that waste incineration was a waste treatment option, and should not be considered as renewable energy. In a report which was submitted to Royal Commission on Environmental Pollution, a UK power company regarded the sale of electricity as 'a method of reducing the cost of waste disposal, rather than an activity undertaken in its own right'¹. Greenpeace demands that the WTE option be

¹ RCEP (1993). *Seventeenth Report. Incineration of Waste*. London, The Stationery Office.

immediately removed from the current Study, and that the government only consider truly renewable, sustainable and safe renewable energy sources such as solar, wind and others.

Incinerators emit a wide range of air emissions, including toxic emissions such as dioxins and furans. Incinerators have been known to cause human health problems, and have been gradually phased out in many countries under immense public pressure. When considering the net energy output in a WTE facility, an incinerator could never meet the criteria of being an energy efficient facility. It burns and wastes valuable resources. To quote Dr. Paul Connett, New York Professor of Environmental Chemistry and Toxicology and Zero Waste expert, "the claim that the modern trash incinerator is a "waste-to-energy" facility makes for good public relations, the reality is that they produce very little energy and energy production certainly doesn't justify the huge costs involved in building them".

Air Emissions from WTE incinerator

Rather than minimising the effect on environment, incineration of waste generates a wide range of releases, which pollute our air and could result in damage to human health and our ecological system. Whatever control technology is applied, all types of incineration result in releases of toxic substances in ashes and in the form of gases/ particulate matter to air. These substances include heavy metals, numerous organic compounds, such as dioxins, and gases, such as nitrogen oxides, sulphur oxides, hydrogen chloride, hydrogen fluoride, together with carbon dioxide. According to the National Research Council (2000):

"...the products of primary concern, owing to their potential effects on human health and the environment, are compounds that contain sulfur, nitrogen, halogens (such as chlorine) and toxic metals. Specific compounds of concern include CO, NO_x, SO_x, HCl, cadmium, lead, mercury, chromium, arsenic, beryllium, dioxins and furans, PCBs, and polycyclic aromatic hydrocarbons..."

Energy recovery at WTE facility

It is not efficient to generate energy from an incinerator, often the energy input into a incinerator is far greater than the energy output. Some figures show that incineration is only about 20% efficient, which means that only one-fifth of the original materials' energy content is captured and turned into electricity.

With recycling as a real option for handling waste, WTE incineration should not even be considered, especially when broader environmental costs and benefits are taken into account. Research undertaken by Coopers and Lybrand (1996) for the European Commission found that, the recycling of materials is far more beneficial than burning them. The study included impacts such as acid-rain gases, fine particulates, greenhouse gas and accidents in their calculation of the costs and benefits. It concluded:

"Recycling offers the most significant net environmental benefits in all Member States although the benefits vary considerably...due to differences in transport costs and energy savings and the mix of recycled products."

Another study in Canada undertaken by Sound Resources Management (1992) proffered the opinion that recycling could save three to five times as much energy as is produced by incinerating municipal solid waste.

Greenpeace recommendation

The main recommendation of the Study is that the government and power companies need to create an enabling framework for the provision of renewable energy. Greenpeace believe that immediate action is required on this recommendation. The government needs to take ownership of and to lead Hong Kong's energy policy – something they have not done to date. The government has the chance to create the enabling framework for renewable energy to become reality. The government will imminently meet with Hong Kong Electric (HKE) and China Light and Power (CLP) for the mid-contract term negotiations or Scheme of Control Agreements (SCAs) – this is a clear opportunity for the government to take ownership of, to lead and to take real action to address the issue.

The Study does not strongly recommend Waste to Energy (WTE) through incineration. Incineration is both damaging to the environment and human health (releasing greenhouse gases and poisonous dioxins) - it is also uneconomic. No other government in the world is seriously considering incineration as a renewable energy source. The consultants note that incineration is primarily for waste treatment, a point that Greenpeace strongly disagrees with, but they do not recommend its use as a renewable energy source. For the sake of public health, the environment and the economy, Greenpeace strongly urge the government to completely discount incineration as a source of renewable energy.

Please contact Apple Chan (apple.chan@hk.greenpeace.org) tel: 2854 8321 or Martin Baker (martin.baker@hk.greenpeace.org) tel: 2854 8383 for further information.

ANNEX

GLOBAL WIND ENERGY POTENTIAL

European Wind Energy Association (EWEA) www.ewea.org

Over three-quarters of the world's wind power is generated in Europe, and the region again fuelled the bulk of last year's growth—an achievement that flows from a steady commitment to developing renewable sources of energy. A total of 5,871 MW – worth €5.8 billion (\$6.2 billion) – was installed in the E.U countries. Total wind power capacity in the region grew 33% to 23,056 MW. The United States added 410 MW (a 10% increase), and Canada about 40 MW. Spain now generates more wind power than the United States.

Total World wind power generation, by region 2002
World total: 31,127 MW

75% Europe
15% US
10% Rest of World

Europe (23,291 MW) United States (4,685 MW)
Rest of World (3,151 MW)

The countries with most wind power capacity are Germany - by far the largest, with just over 12,000 MW - followed by Spain, the United States, Denmark, and India. A listing of capacity by country is detailed in the appendix to this release.

“Wind power contributes to diversification, opens new markets, provides a hedge against fuel price volatility and reduces environmental constraints. The wind power sector today is actively

engaging in energy markets, largely in electricity. Companies in the energy business will need a comprehensive analysis of wind power, and this can run the spectrum from competition, to co-existence to collaboration. Wind power provides real business change, rather than superficial PR that sustains the status quo. The wind industry is a dynamic growth sector that requires significant investment, so inter-relationships with traditional energy players will become more evident". Corin Millais, Chief Executive of EWEA

Analysis by the EWEA shows that there are no technical, economic, or resource limitations for wind power to supply 12% of the world's electricity by 2020. Today wind power supplies approximately 0.4% of world electricity demand. With stronger political commitments worldwide, the wind energy industry could install an estimated 230,000 MW by 2010, and 1.2 million MW by 2020.

Recent Wind Energy News:

Another record year for German Wind Power

4.5% of German electricity supply from wind energy in 2002. Schleswig-Holstein, Germany's most northerly lander, derived 25% of electricity from wind in 2002.

<http://www.solaraccess.com/news/story?storyid=3994>

German wind energy news:

Wind Energy Market slows due to tougher planning laws

<http://www.planetark.org/dailynewsstory.cfm/newsid/20348/story.htm>

GLOBAL SOLAR ENERGY POTENTIAL

Solar power could provide energy for more than 1 billion people, creating over 2 million jobs by 2020, and 26% of global energy needs by 2040, according to a report released by the European Photovoltaic Industry Association (EPIA) (Oct 2001).

"It's a realistic, achievable goal, based on the current state of the industry and opportunities in the market, but it requires clear political support from governments around the world," said Sven Teske, Greenpeace energy expert. "We need to massively boost renewable energy sources if we are to phase out the fossil fuels that threaten our climate.

The report shows that by 2020 global solar output could be 276 Terawatt hours, which would equal 30% of Africa's energy needs, or 10% of OECD European demand, or 1% of global demand. This would replace the output of 75 new coal fired power stations and prevent the emission of 664million tonnes of carbon dioxide. The global solar infrastructure would have an investment value of US\$75 billion a year and lower the cost of solar modules to US\$1 per Wp achieved.

By 2040 global solar output could be more than 9000 Terawatt hours, or 26% of the expected global demand which would have increased from 27,000 to 35,000 Terawatt hours. That's more than the combined demand of OECD Europe and North America in 1998.

Renewable energy technologies, utilising the power of not only the sun, but also wind and water, generate clean energy that will neither run out nor lead to the build-up of greenhouse gases that cause climate change.

Choosing renewables over fossil fuels is also to choose energy security. Fossil fuels, due to their wholesale contribution to the climate catastrophe, represent an intrinsically insecure energy source regardless of whether they are come from Alaska, the Caspian Sea, the Middle East or elsewhere. Turning to renewables would mean that countries are able to generate their own indigenous energy supplies, which would be reliable, wherever they were generated.

Solar Generation: PV's Contribution to Industry, Employment and the Environment

For the solar production industry, global annual shipments of PV modules will rise from 253 MWp in 2000 to more than 50,000 MWp in 2020.

For the job seekers of the 2020 generation, this will be a major contribution towards their employment prospects. On the assumption that more jobs are created in the installation and servicing of PV systems than in their manufacture, the result is that by 2020, around two million full time jobs would have been created by the development of solar power around the world. The majority of those would be in installation and marketing.

Our goal now must be to mobilise the necessary industrial, political and end-user commitment to this technology and, more importantly, the service it provides. We must redouble our efforts to ensure that the population born today receives from all the socio-economic and environmental benefits that solar electricity offers. The Solar Generation should know no north/south divide. It should be an inclusive generation bringing together by 2040 a significant fraction of the world's population in both industrialised and developing countries – a generation supplied by an industry driven by customer needs and the ability of a sophisticated global market to meet those needs.

Global Solar Electricity output in 2020: 276 TWh

30% of total demand in Africa
10% of total demand in OECD Europe
1% of total global electricity production
26% of total global demand

more than the combined demand in OECD-Europe and OECD-North America in 1998

Global Solar Electricity

Output in 2040: 9,113 TWh

Detailed Projections for 2020 PV systems capacity 207 GWp
Grid-connected consumers 82 million worldwide
35 million in Europe
Off-grid consumers 1 billion worldwide
Employment potential 2.3 million full-time jobs worldwide
Investment value \$75 billion per annum
Cost of solar modules Level of \$1 per Wp achieved
Cumulative carbon savings 664 million tonnes of CO₂

Source: Greenpeace report

The Solar Generation report is available from:

www.greenpeace.org/~climate/climatecountdown/solargeneration

From: Renewable Energy [renergy@emsd.gov.hk]
Sent: 07 April 2003 10:05
To: Chan James
Subject: Fw: Renewable Energy Report

Importance: High

----- Original Message -----

From: "blurmax" <blurmax@hongkong.com>
To: <renergy@emsd.gov.hk>
Sent: Friday, April 04, 2003 10:06 PM
Subject: Renewable Energy Report

Being a Hong Kong citizen and a global being, I fully support the future development of renewable energy in Hong Kong.

I suggest the development of energy programme provided by solar, wind and water energy could be co-operated with our mainland government. It will be ideal if at least 5% of the energy provided to HK is supplied by renewable system in the coming future.

Your notification on this e-mail is much appreciated

Save the future for your next generation please

Marubeni

Asian Power Ltd.

Suite 3201-2, Shell Tower, Times Square,
1 Matheson Street, Causeway Bay
Hong Kong

4th April 2003

Attn: Energy Efficiency Office
Electrical and Mechanical Services Department
11/F., 111 Leighton Road
Causeway Bay
Hong Kong

Fax: 852 2890 6081

Re: Proposal and Comment on Your Report – Study on the Potential Application of Renewable Energy in Hong Kong

We are Marubeni Asian Power Limited in Hong Kong, a subsidiary of Marubeni Corporation in Japan. Our core businesses are development, construction and sponsor of power plants and energy related projects in the Asian region.

With reference to your recent report – Study on the Potential Application of Renewable Energy in Hong Kong, we would like to make the following comments and proposals.

1. Proposal on Fuel Cell Application in Hong Kong

Marubeni appreciates the supportive attitude on fuel cell application in Section 2.4 of your report. Fuel cell is so far the cleanest type of electricity generation using fossil fuels.

In Hong Kong, there is no natural gas available for industrial or domestic usage, the only available gas in bulk quantity without custom-built storage is town gas, which is a typical fossil fuel and is relatively very expensive. In view of this and the overall situation in Hong Kong, Marubeni believes one of the best fuel in Hong Kong for renewable energy fuel cell application is the digester gas produced from the several wastewater treatment plants. This approach can be respected as a true renewable energy arrangement.

One typical renewable energy cogeneration proposal is to install fuel cells in sewage treatment plants and use the digester gas as the main fuel. The electricity generated from the fuel cells will be supplied to the facilities inside the treatment plants. Balance of electricity (excess or make up) will be delivered to or supplied from the grid. The possible cogeneration medium can be steam, hot water or chilled water, depending on the necessity of the user.

Marubeni has been working very successfully on a similar renewable energy fuel cell project in Japan. A 250 kW Molten Carbonate Fuel Cell has been installed inside a major brewery. The digester gas produced from the wastewater treatment plant in the brewery is treated and processed before supplying to the fuel cell. A heat recovery steam generator is installed to collect the waste heat in the emission gas and generates steam, which is supplied back to the processing facilities in the brewery. The electrical efficiency on the fuel cell alone is close to 50% whilst the overall cogeneration efficiency is approaching 70%. On-load testing of the fuel cell and cogeneration facilities is on going. Full load testing is scheduled to be completed in the next two months.

Another feasible renewable energy fuel cell project in Hong Kong is to burn landfill gas. This is more challenging because large capacity landfill gas processing facilities have yet to be explored and also the O&M costs is relatively higher than using digester gas. Since landfill gas is readily available in huge quantity in the several restored and strategic landfill sites in Hong Kong, the potential on this approach in realizing a renewable energy fuel cell project is very large if other objective conditions are fulfilled.

2. Comment on Strategy for Renewable Energy Project in Hong Kong

In principle, Marubeni agrees on the several suggestions in Sections 4 and 5 of your Report. Among which, we believe the most challenging issues for renewable energy projects in Hong Kong are:

- i Grid Access (your Section 2.4). It is understood that almost all kinds of renewable energy generations have to connect their electricity output to a grid in order to smooth out the supply and demand fluctuations.
- ii Market Creation. Marubeni fully supports Option B – *Establishing a RE fund or account to purchase renewable energy* and Option C – *Green Electricity Scheme* (your Section 4.2.2). We fully agree on one of your suggestion in your Section 5 – A necessary role for government in creating the market for renewable energy.

We are very pleased for your kind attention to our comments and proposals. If you need any further information or clarification, please contact me at any time.

Regards,


Paul Szeto
Technical Director
Marubeni Asian Power Ltd.

Tel: 852 25062288
Fax: 852 25062328

----- ÀàSeªî ACOR&D/HQ/EMSD ©ó 2003/04/03 02:29 PM -----

"Donald
Latter" |-¥óªH;G info@emsd.gov.hk
<lisadon48@ho °Æ¥»\$Û°e;G
tmail.com> ¥D!®;G Renewable energy

2003/04/03
01:43 PM

Dear Sir

Re: Public Consultation for the Govt. Renewable Energy Study.

I would like to add my support to those who are advocating a significant increase in the amount of energy provided for Hong Kong from renewable sources. In particular wind energy seems to be by far the best bet. The recent forum on wind energy held by Friends of the Earth illustrated what tremendous potential there is for this, if only the government will put its

full weight behind it. The new generation of wind turbines are proving that

this is an economically viable option, and by placing them offshore this will reduce the possible negative visual and auditory impact of a wind farm.

But what is needed is strong government support especially in the form of financial incentives to encourage both the development of better technology,

and to encourage the switch to using the technology that already exists. Without the lead of the government, nothing much will happen.

My reasons for supporting the use of renewable energy scarcely need to be mentioned. Hong Kong is a great city, but the air pollution is an absolute disgrace. I would hate to have to leave here because of fear for the health

of my children. Continued use of fossil fuels is completely unacceptable - the Iraqi War is just one consequence of our dependence upon them, and our refusal to countenance inevitable changes in our way of life. It would be a

source of great pride for everyone in Hong Kong if it took the lead in transforming the city into a truly sustainable one. Renewable energy would be the first essential step.

Don Latter

MSN Instant Messenger now available on Australian mobile phones. Go to http://ninemsn.com.au/mobilecentral/hotmail_messenger.asp

『香港使用可再生能源的可行性研究』- 第一階段研究

A. “Study on the Potential Applications of Renewable Energy in Hong Kong” – Stage 1 Study Report

- The report is detailed & too technical, it is recommended to be commented by some institutions (like HKIE, IEE), Universities, Power Companies and so on.

B. 摘要

1. 此計劃在執行/研究上有否時間表？
2. 現在香港是否有急切性發展新或增加發電系統？
3. 現在香港之經濟情況, 這新發展是否必要？
4. 市場上有否燃燒垃圾發電, 可減少垃圾堆填壓力。
5. Page 2: 第二階段研究
 - 可否包括風能、燃料電池及廢物轉化能作研究/應用？
 - 應多實質研究, 如那地方使用那系統, 時間, 金錢, 技術, 成效等。
 - 作小型試辦研究。
 - 作宣傳推廣, 並教育小市民再生能源。令小市民可自行安裝一些小型再生能源系統, 如: 太陽能熱水器, 光能外圍燈, 小風能發電裝置等。
6. 各發電方案, 可否在長遠操作、維修、技術/技術人員、金錢上、需否引入專材上作出評估？
7. 各發電方案之建設時期長久, 將來之擴充與否, 是否應作考慮？
8. 可否考慮太陽能獨立裝置, 如: 街燈、廣告牌等。
9. 可否利用現有之大廈空調/採暖系統, 循環再用發電。
10. 中央排污之污水出口可否是水力發電的位置？
11. 2.2 光伏系統 / 2.2.1 潛在資源
 - 「如果香港所有土地都裝上橫向光伏板, ...」, 這假設及其所帶出之數字太不設實際。
 - 光伏系統是否要考慮光伏板本身之耐用性及能否接受高空硬物跌下之衝擊, 如天然冰雹。
 - 沙塵污染會否令光伏板減弱。
12. 2.2.2.2 商業價值
 - \$2.2 - \$4.1/kWh 是傳統的 10 倍, 這個數字是否值香港去推行光伏板發電。
13. 2.3 風能
 - 2.3.2.2 推行上的問題-制度上的限制
 - 可否考慮將某些離岸島嶼再加上填海造地作風力場。
 - 深圳郊區是否有可行之地方 (大亞灣亦是設於廣東的發電場)。
14. 3.1 一般問題
 - 是否可以香港政府作中介人, 將再生能源賣給兩電, 而兩電作減費補貼市民。

意見完

陳健雄

二零零三年四月三日

香港工程師學會

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Your Ref: EEO/RE/07/10

By fax and by mail
(Fax no: 2890 6081)

3 April 2003

Director of Electrical & Mechanical Services
Electrical & Mechanical Services Department
98 Caroline Hill Road
Causeway Bay
Hong Kong

(Attn: Mr LEUNG Kin Man)

Dear Mr LEUNG

Study on the Potential Applications of Renewable Energy in Hong Kong

Thank you for your letter of 12 February 2003 inviting the HKIE to give comments on the captioned subject. We have received comments from our Electrical Division, as set out in the attachment, and would like to forward to you for your consideration.

Thank you for your kind attention.

Yours sincerely


Monica YUEN (Mrs)
Secretary

Enc

MY/cm

**The Hong Kong Institution of Engineers
Comments on Study on the Potential Applications of Renewable
Energy in Hong Kong**

- 1. Compulsory targets for Renewable Energy (RE) or any other energy sources may lead to inefficiency.**

Compulsory targets, ignoring the fundamentals of actual cost and benefits and the adverse impacts, will inevitably lead to market distortions. At the same time, using the targets to shield the RE from competition with other energy sources do not help RE development. This approach will slow down further development of RE technologies because of the absence of competitive pressures.

- 2. The RE targets in the report could be too high.**

The RE resource "potentials" in the Report are considered to be over-estimated. Some of them appear impossible and should not be considered as "potentials". Cost-benefit and adverse-impact analyses are not included in the Report. Subsidies will be required to make these targets achievable. From cost point of view, if the subsidies are not provided to the RE, the present targets of 1, 2, 3% might well be too high.

- 3. Fuel cells and Municipal Solid Waste (MSW) should not be considered as renewable energy.**

International Energy Agency does not consider fuel cells, industrial waste, and non-biodegradable MSW to be RE. Fuel cells run on hydrogen, which is generated from either fossil fuels or RE. If the hydrogen is from fossil fuels, they are definitely not RE. If it is from RE, then the prime source of RE has been counted already. Counting fuel cells as RE will be "double counting".

MSW should be a waste management issue instead of a RE source. MSW needs not be renewable. Modern waste management concentrates more on Reduction, Recycle and Reuse (ie 3R) instead of burning them. MSW can be reduced significantly if the 3R are successful. Energy-from-waste is only one of the many not-so-preferred waste management solution.

- 4. Landfill gas electricity generation should not be counted as RE.**

Landfill gas is the product from MSW. Similar to (3) above, it is not a RE. Furthermore, landfill gas electricity generation is only one of the many uses of landfill gas. The best use for landfill gas is conversion to gas fuel, where the energy lost is much less in the process.

5. It is correct to focus on the application of RE technologies in the HKSAR.

The well known reliability problem of electricity supply in the Mainland makes the option of import of RE electricity from Mainland worrisome. With the rapid development of Guangdong, the power generation in Guangdong will be more difficult to meet its ever growing power demand. If there is renewable energy source developed in the Mainland, naturally it would be used first to meet the growing demand of Guangdong so as to reduce the environmental impact of its conventional generators. Developing RE locally will therefore benefit the HKSAR environmentally and economically.

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Email christophe.inglin@shell.com.sg
Internet www.shellsolar.com

Date: 31 March 2003

Your ref: Study on Potential Applications of Renewable Energy in HK - Executive Summary Report

Our ref: EMSD-HK-Survey-response-030331.doc

Dear Sir,

We welcome the EMSD's initiative to formally study potential applications of renewable energy in Hong Kong. Our feedback concerns the discussion on Photovoltaics, or PV.

Resource Definition

The structured Resource Definition (Total Resource, Technical Resource, Potential Resource, ... Acceptable Resource) is useful for establishing a common base for discussion.

Consider improvements in efficiency

Since the report summarises projected contributions from RE sources over a 20-year horizon (Table 2), it is worth noting that PV conversion efficiencies are likely to increase by 50-80% in the next 2 decades. Hence, while the report estimates flat-mounted PV systems generating ca 121kWh/m²/year, this could increase beyond 200kWh/m²/yr during the forecast period.

Consider peak-shaving benefits in deregulated electricity market

When comparing the cost & price of different sources of electricity, the report summary does not appear to differentiate between peak and off-peak pricing. Comparing the cost of PV-electricity with average power station pricing is misleading.

As metering technology makes time-of-day pricing feasible, future deregulated electricity markets will price according to supply & demand. For example, midday and early afternoon demand will greatly exceed nighttime demand during summer months, and deregulated pricing will reflect this.

Data from 1999 show that in Hong Kong, air-conditioning accounted for 45% & 47% of electricity consumption in residential and commercial buildings respectively.

PV systems have the advantage in tropical climates of generating most energy when the sun is most intense and air-conditioning use increases demand for electricity.

Setting an effective policy to promote Renewable Energy markets in Hong Kong

Renewable Energy market incentives are nothing new. Hong Kong can take advantage of hindsight, to adapt the more successful models from overseas, and avoid the less effective ones. But whichever model Hong Kong chooses, three parameters are critical for success:

1. The scheme must last at least 4 years without interruption or significant alterations that would cause uncertainty and strangle growth.
2. Financial incentives should decline in a clearly defined manner over time, to reflect expected decreases in the cost of buying and installing systems, and to gradually wean the market from price support mechanisms.
3. Once announced that the government is considering introducing an incentive scheme, the scheme must take shape and start as soon as possible. This is to minimise the inevitable slow-down while the market “waits and sees” what incentives will come.

Looking forward to Hong Kong successfully pioneering the regional PV industry!

Yours sincerely

Shell Solar Pte Ltd

Christophe Inglin



中華人民共和國香港特別行政區
Hong Kong Special Administrative Region of the People's Republic of China



立法會（社會福利界）羅致光議員辦事處
OFFICE OF DR. LAW CHI KWONG LEGISLATIVE COUNCILLOR
(SOCIAL WELFARE CONSTITUENCY)

香港銅鑼灣禮頓道 111 號 11 樓
機電工程署
能源效益事務處
總工程師
梁建民先生

梁先生：

對於政府近日公佈的“香港使用可再生能源的可行性研究”，民主黨有數項建議，現向 貴署提交，懇請察閱。

民主黨有興趣繼續參與政府在可再生能源方面的研究討論。若閣下對建議有任何跟進，歡迎致電 2509 3121 與本人或助理盧小姐聯絡。

立法會議員兼
民主黨環境政策發言人

羅致光

羅致光謹啓

二零零三年三月二十八日

副本送：環境運輸及工務局局長廖秀冬博士

立法會(社會福利界)羅致光議員辦事處

OFFICE OF DR. LAW CHI KWONG LEGISLATIVE COUNCILLOR
中環花園道三號萬國寶通銀行大廈 601 室 Rm 601 CitiBank Tower, 3 Garden Rd,
Central
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發展可再生能源立場書

自立法會於二零零二年十月三十日會議上通過羅致光議員提出的“發展可再生能源”動議，民主黨便一直關注政府在發展可再生能源方面的工作。就政府近日公佈的“香港使用可再生能源的可行性研究”，民主黨對政府進行研究表示歡迎，但同時亦提出以下意見，希望政府當局接納：

1. 未能清晰界定可再生能源的定義

政府既然進行可再生能源的研究，便需為「可再生能源」立下定義，令公眾對此有一共識。可是，顧問研究從頭到尾也沒有界定何謂「可再生能源」，並將廢物轉化能源(不論是堆填區沼氣或是熱能處理)納入可再生能源的研究範圍內，民主黨對此表示關注。根據聯合國環境計劃(UNEP)對可再生能源下的定義，「可再生能源」是指那些取之不盡的天然資源，例如太陽能、風能、地熱能、水力能、潮汐能、生質能等，都是透過轉化自然界的水、風、太陽光等能量成為能源，過程中不會產生污染物。因此，民主黨建議政府接納 UNEP 的「可再生能源」定義，並在研究報告中刪除「廢物轉化能源」及「燃料電池」部分。

2. 訂下過低的可再生能源發展目標

顧問報告建議港府為發展可再生能源設訂目標，即把可再生能源的每年電力供應佔有率(以 1999 年為準)訂為：2012 年佔 1%；2017 年佔 2%及 2022 年佔 3%。此目標還包括以上提及的「廢物轉化能源」項目。在摒除廢物轉化能源後，真正的可再生能源目標分別只有 0.05%；0.39% 及 1%。民主黨同意顧問報告建議政府為發展可再生能源設訂目標，但認為此目標明顯太過低，未能刺激可再生能源的發展空間。

根據顧問建議的可再生能源發展目標，即使到了 2022 年，真正可

再生能源的供應量也只有 378 百萬千瓦時，只能滿足 1999 年全年電力需求的 1%。此目標與國際水平相隔甚遠，民主黨建議政府可參考去年地球高峰會各國就再生能源提出的發展目標。民主黨建議政府發展再生能源的目標(以 1999 年為準)應訂為未來 5 年(2008)1%; 10 年(2013)3%及 15 年(2018)年為 6%。

民主黨亦建議政府在制訂目標前，應盡量聽取各方面相關團體及人士的意見，以及為公眾提供一參與的渠道。

3. 顧問研究未能反映傳統發電的真實成本，忽略了可再生能源為社會及市民健康帶來的得益

民主黨十分認同顧問報告指出現時香港能源是免稅的，亦沒有氣體排污費，因此難以反映燃燒化石燃料對社會造成的污染及市民健康的代價，報告亦指出這會對可再生能源的發展不利。可報告中並沒有提及如何令可再生能源的電力價格可與傳統電力在市場上公平競爭。民主黨就此問題嘗試將傳統發電的真實成本(即包括社會成本在內)與再生能源發電的成本比較，結果發現，在全面計算發電成本後，傳統發電成本比起原來上升了 31%。這還未包括化石能源終有一天耗盡的惡果。再生能源發電與傳統發電在價格上更為相近，甚至可以是更低，打破了傳統認為可再生能源電力昂貴的看法。要令可再生能源具市場競爭力及吸引再生能源項目投資者，民主黨認為政府的策略之一是要主動使傳統用石化燃料發電的外部成本內部化，又透過實行排污交易政策，促使電力公司改善對環境及社會造成的影響。對於這部分的研究，請參考附錄一。

4. 制訂可再生能源政策，檢討利潤管制計劃

為保障可再生能源的發展，民主黨建議政府制訂一套可再生能源政策及條例。事實證明，美國所以能在風能、太陽能方面取得成就，一個重要原因是可再生能源發展在很久以來已得到法律和政策的倡導。1978 年美國的法例就規定電力公司必須按可避免成本購買可再生能源的電力。到 1992 年，能源法進一步要求到 2010 年，可再生能源的供應量應比 1988 年增加 75%；同時規定對再生能源的開發給予投資稅額減免。政策就政府如何支持、鼓勵、以至支持的力度都作出具體規定。

中國對可再生能源方面的開發利用亦十分重視，亦制訂了相關的政策。近幾年，中國簽署了《里約宣言》、頒布了《中國 21 世紀議程》、於 1996 年制定了《1996—2010 年中國新能源和可再生能源發展綱要》。

各國採用不同的方法以刺激可再生能源的發展。然而，香港在這方面相當缺乏。為此，民主黨建議政府趁 2008 年與兩間電力公司重新訂定專利的時機，接納民主黨以上的提議，制訂可再生能源政策，以鼓勵可再生能源的發展。

為打破現時利潤管制計劃的限制及為可再生能源發電項目創造市場，顧問報告中提出了甲、乙及丙三個方案。民主黨認為甲、丙兩方案可一起實行，安排如下：

- 1) 政府應檢討現有規管機制，為兩家電力公司定下採用可再生能源發電的目標；
- 2) 政府應開放電力市場讓其他獨立電力供應商供應可再生能源的電力，此計劃收費由供應商自由釐定，用戶是可以自由選擇電力供應。政府亦可考慮率先購買可再生電力，以鼓勵這個新的供應市場。

5. 研究跨境合作的可行性

研究報告中並沒有提及跨境合作，引入再生能源的可行性。可現時，香港與廣東省的電網早已相通，中電自 94 年開始已向廣東省購買核電。廣東省有兩個風力場，未來五年，將會增建七個，而且全部均接駁廣東省電網。民主黨建議政府可積極考慮與廣東省政府合作，共同研究發展及引入可再生能源的可行性。

附錄一

就如何令再生能源具有市場競爭力，民主黨嘗試將傳統發電的真實成本(即包括排污交易及市民健康代價在內)與再生能源發電的成本比較，結果如下：

一. 傳統發電成本

1. 發電成本 / 千瓦時¹ : \$0.2²- 0.4³

平均成本\$(0.2+0.4)/2=\$0.3

2. 社會成本 / 千瓦時：

發電廠於 2000 年發電量為 31329 百萬千瓦時⁴，產生二氧化碳 2800 萬噸，二氧化硫 49078 噸⁵，氮氧化物 18628 噸⁶，粒子 1213 噸⁷，對環境造成了嚴重的影響，此令社會受污染的代價，是應該計算在發電成本之內。

a. 排污交易成本

二氧化碳排放成本：

- 1 千瓦時產生的二氧化碳: 0.0006 噸二氧化碳⁸
- 1 噸二氧化碳的排污交易價: US\$2.5-22⁹
- 1 千瓦時的二氧化碳排污交易成本: $0.0006 * (22+2.5) / 2 = \text{US}\0.00735
= HK\$ 0.057

二氧化硫排放成本：

- 1 千瓦時產生的二氧化硫: $49078 / 31329 * 10^6 = 0.0000015$ 噸
- 1 噸二氧化硫排污交易價: US\$62-212¹⁰
- 1 千瓦時的二氧化硫排污交易成本: $(212+62) / 2 * 0.0000015$

¹ 成本包括資本成本、營運及維修

² 複合循環燃氣渦輪發電廠；資料來源：[香港使用可再生能源的可行性研究第一階段研究摘要](#)。

³ 裝有除硫裝置的燃煤發電廠；資料來源：[香港使用可再生能源的可行性研究第一階段研究摘要](#)。

⁴ 香港能源統計: $112783 \text{ 兆焦耳} = 112783 * 10^{12} / 3.6 * 10^6 = 31329$ 百萬千瓦時

⁵ 環保署網頁: $56803 \text{ 噸} * 86.4\% = 49078$ 噸

⁶ 環保署網頁: $43627 \text{ 噸} * 42.7\% = 18628$ 噸

⁷ 環保署網頁: $3304 \text{ 噸} * 36.7\% = 1213$ 噸

⁸ 政府灣仔計劃: 847 千瓦時的太陽能發電可減少 508 千克的二氧化碳，照此推算，1 千瓦時的傳統發電可產生 0.6 千克的二氧化碳

⁹ 資料來源: www.cleanerandgreener.org/environment/transactions.htm 不同國家的排污交易價格

¹⁰ 資料來源: www.cleanerandgreener.org/environment/transactions.htm 不同國家的排污交易價格

=US\$0.0002055

=HK\$0.0016

氮氧化物排放成本:

- 1 千瓦時產生的氮氧化物: $18628 / 31329 * 10^6 = 0.0000005945$ 噸

- 1 噸氮氧化物排污交易價: US\$1000¹¹

- 1 千瓦時的二氧化硫排污交易成本: $1000 * 0.0000005945$

=US\$0.0005945

=HK\$0.0046

b. 健康代價

用化石燃料包括煤和石油發電，除會排放空氣污染物和溫室氣體，嚴重影響環境外及氣候外，還會影響市民的健康。民主黨又嘗試將市民的健康代價計算在傳統發電成本之內。有關不同的污染物所造成的健康代價已列在下表之內。

Economic cost (in HK\$ million)			
Relative Risk 50ug /m ³	Respiratory Diseases	Cardiovascular Diseases	Combined Respiratory & Cardiovascular
NO ₂	522.20	451.90	852.34
SO ₂	195.82	282.44	487.05
RSP	326.37	169.46	487.05
O ₃	652.75	395.41	852.34

(以上資料來源：環保署網頁)

$$\begin{aligned} 1 \text{ 千瓦時的健康成本} &= \frac{52.34 * 42.7\% + 487.05 * 86.4\% + 487.05 * 36.7\%}{31329} \\ &= \$0.03 \end{aligned}$$

因此，傳統發電的總成本應是: $\$ (0.3 + 0.0016 + 0.057 + 0.0046 + 0.03) = \$ 0.3932$

¹¹ 資料來源: www.cleanerandgreener.org/environment/transactions.htm 不同國家的排污交易價格

二. 可再生能源發電成本

發電成本 / 千瓦時

- 風能(風力發電場): \$0.2-0.35¹²
平均成本\$0.275
- 風能(近岸風力發電場): \$0.36-0.64¹³
平均成本: \$0.5
- 光伏系統: \$2.2-4.1¹⁴
平均成本\$3.15
- 燃料電池: \$2.4¹⁵

三. 可再生能源發電與傳統發電成本比較

再生能源發電成本/ 千瓦時	傳統能源發電成本/ 千瓦時	相差/ 千瓦時
風能(風力發電場):\$ 0.275	\$ 0.3932	-0.118
風能(近岸風力發電場): \$ 0.5		+0.107
光伏系統: \$ 3.15		+2.76
燃料電池: \$ 2.4		+2.0

由此可見，在全面計算發電成本後，傳統發電的成本比起原來上升了 31%。這還未包括化石能源終有一天耗盡的惡果。再生能源發電與傳統發電在價格上更為接近，甚至是更低(請見風力發電)，打破了傳統認為可再生能源電力昂貴的看法。要令可再生能源具市場競爭力及吸引再生能源項目投資者，民主黨認為政府的策略之一是要主動使傳統用石化燃料發電的外部成本內部化，又透過實行排污交易政策，促使電力公司改善對環境及社會造成的影響。

¹²資料來源: 香港使用可再生能源的可行性研究第一階段研究摘要。

¹³ Ibid.

¹⁴ Ibid

¹⁵ Ibid

Facsimile
message

Environmental
Resources
Management

To Mr. K M Leung
Chief Engineer/Energy Efficiency A, EMSD

Copied to

From Calvin Lai

Ref/Project number C2487fax_photovoltaic panel inquiry EMSD

Subject Photovoltaic Panel at Wanchai Tower

Date 7 March 2003

21/F Lincoln House
979 King's Road
Taikoo Place
Island East, Hong Kong
Telephone: (852) 2271 3161
Facsimile: (852) 2723 5660
E-mail: kalvin.lai@erm.com



Page 1 of 1

Dear Mr. Leung,

We are writing to inquire about the photovoltaic (PV) panels installed at Wanchai Tower.

We refer to a document named "Study on the Potential Applications of renewable Energy in Hong Kong" submitted by EMSD to the Panel on Environmental Affairs of Legislative Council. The document mentioned that PV panels with an estimated total power output of 55kW were installed at Wanchai Tower and its performance is being evaluated.

Our client has strong interest on the PV panels and intends to apply it in their project in China. They would like to know

- The supplier of the PV panels in Hong Kong;
- The installation cost of the PV panels; and
- The performance of the PV panels.

Thanks for your help in advance and we look forward to your reply. Please feel free to contact us if you have queries.

Regards,

A handwritten signature in black ink, appearing to read "Calvin", written in a cursive style.

Kalvin Lai
Assistant Consultant

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Destination fax number: 2890 6081

收件者: <renergy@emsd.gov.hk>
傳送日期: Tuesday, 4 March, 2003 9:43
主旨: Response to stage I study

I was interested that tidal energy has been excluded as a possibility without any consideration in the report. I had understood that the tidal effects around Kap Shing Moon and Ma Wan Island are very strong. While it would be impractical to block off the whole channel since it is needed for shipping, is it not worth considering whether turbines attached to the sides of the island protecting the Tsing Ma Bridge tower, or placed on the bottom of the sea (as now contemplated in the Bristol Channel in the UK) might not generate significant power.

Regards,

Kim Salkeld.

Reference: Study on the Potential Applications of Renewable Energy in HK
(Executive Summary Report – Final Preview – released 6 February 2003)

1 Background

1.0.0 Analysis of the scope and potential of technologies as described in the Report is regarded as weak. It should include emerging technologies and balanced resources

1.1.0 Energy conservation and forecast use

1.1.1 Analysis of energy use, forecast and conservation not included. (1999 figures used as the base data.) Yet overall proportion of electricity supplied by RE should not be estimated without considering forecast to 2022 – changes in weather patterns, population, construction, building & services technologies and energy use.

1.1.2 It is suggested that strong energy conservation measures must be coupled with the generation application of new advanced technologies that reduce the energy consumption of all systems and equipment. (cf Melbourne City Study*)

1.2.0 Balance of resources

1.2.1 An important aspect of the resource analysis also concerns balance of resource types in terms of steady and intermittent. Solar is an intermittent supply and ideally should be complemented with steady resources. Marine-based resource and also MSW-based resource both have this characteristic and merit detailed inclusion and further study for that reason.

1.3.0 MSW:

1.3.1 Since MSW disposal is a major problem for Hong Kong, yet potentially also a source of biogas, it merits greater consideration than given here. Effective separation and sorting into organic/bio-degradable material can produce biogas as a distributed supply. Importantly, the quantity can be assessed and regulated thus providing HK with a reliable steady energy resource. Opposition to Waste-to-Energy is based on burning and release of toxins. Proper separation and sorting, permits the recycling of non-organic matter and the production of biogas from organic waste.

1.4.0 Marine resources:

1.4.1 The Report, in concentrating on wide-scale and building related resources, is too limited in its scope considering the timeframe of 20years. The Report has evidenced little investigation of the emerging technologies, most particularly the potential of marine resources. These can supply steady, 24hr all-year resources and should be further investigated considering the proximity of the sea to our territory.

Built projects are being studied and their performance monitored in various countries
UK/Japan/Germany/China - power from waves – oscillating columns
Philippines/UK - marine turbines

Footnote:

* A Costed Strategy and Action Plan to Convert All Municipal Services in the City of Melbourne to Renewable Energy Supplies prepared for the Melbourne City Council ref EWG SF01/2001

2.0.0 Technologies Review – Potential Resource

2.1.0 Key local characteristics:

2.1.1 Report emphasis on the means of distributed generation in urban areas because that is the location of demand and those technologies that are building related and non-polluting. Focus accepted but Report makes no reference to the high losses from overshadowing in BIPV applications. This is particularly critical in the high-rise, high-density context of HK.

2.2.0 PV generated electricity:

2.2.1 HK Solar energy resource + PV yield:

Apparent simplistic assessment of the solar energy resource undermines the credibility of the resource potential.

2.2.2 There is no reference in the resource assessment to changing weather patterns and shift of solar resource. This comment applies to all solar-based technologies. Different solar intensity at different solar altitude has implications for PV and solar thermal yield.

2.2.3 Most evaluations of PV yield are optimistic because the extent of shadowing has been underestimated. This is true in low-rise, low-density applications. It is far more critical in HK's high density and high-rise built environment. Planning for and conservation of solar access is therefore critical to optimize HK's potential yield. Presently there is no legislation that protects solar access rights and no mention in the report.

2.3.0 Electricity storage:

2.3.1 Electricity is generated as it is needed with no storage though traditionally pumped hydro reservoirs have provided the reserve. As an intermittent resource solar energy requires back-up or storage means. A potential partnership with fuel cell technology is promising and needs investigation. Solar energy generated electricity creates hydrogen. Hydrogen generated by electrolysis is a useful storage method that also provides a pure hydrogen supply for fuel cell technologies.

3.0.0 Issues & Barriers

Recognise that this section is the most valuable in correctly identifying the barriers in HK.

3.1.0 Generic

3.1.1 Level playing field

Established fossil fuel electricity generation has benefited from public subsidy for many years. The Scheme of Control Agreement has funded the installation of clean-coal and natural gas technologies. Levelling the "playing field" for new and renewable resources now entering the market by providing public funding to lower those costs is essential if GHG emissions issues to be tackled.

3.1.2 Cost of externalities

What is the financial impact for HK of the costs to health, business, tourism etc ("the externalities") of pollution from SO_x/NO_x/CO₂ emissions? The Report rightly addresses this as essential to the "level-playing field". Though acknowledged to be difficult, assessing the financial costs of the externalities is critical in assessing the true costs and value of different methods of electricity production.

3.1.3 Grid-connection:

Most importantly, Independent Power Providers (IPP) must be allowed to grid-connect and the related charges must be transparent and fair. HKU PV Research has recently written to CLP Power requesting greater transparency in the charges proposed by the utility to be levied for the "small green projects with community benefit" category. Grid-connection and transparency of the charging process should be available to all.

3.2.0 Technology specific

HK PV Research has experience of the lack of knowledge amongst design and construction professionals as well as amongst the contracting and sub-contracting companies. The Report's identification that both unfamiliarity and lack of technical "know-how" are very real obstacles to successful design and implementation of BIPV in HK is emphatically endorsed. It requires effective training programmes to be implemented quickly so that designers and installers have some knowledge and through guided application become proficient.

4.0.0 Strategy

Report delicately writes around the present resistance of both utilities to giving up their monopolies and preferential treatment. Government must introduce some more competition into the market or the two utilities will always hold the government to ransom. Towngas already provides strong competition in the domestic market and current intransigence by the utilities reflects this threat. The 'win-win' situation advocated is always desirable but re-regulation to open the HK market to IPP is also necessary.

4.1.0 Objectives/approach

4.1.1 Government must use the power of its position as major purchaser to bring the utilities to the understanding that RE is necessary. The existing regulatory framework has to change or at least have a new arrangement alongside it to cover the transition to new post-2008 electricity generating structure. Both utility companies presently operate in S. Australia where renewable proportion is mandated at 5%.

4.2.0 Enabling measures – grid connection

4.2.1 IPP to have grid-connection access. This must apply to Towngas as much as any other electricity generator. Problems with existing geographical monopoly is that there are few alternatives to the present set-up. This is exactly the reason to have diversity of supply and a competitive market.

4.3.0 Technology specific measures (BIPV)

4.3.1 The Summary reports "it is necessary to create a framework in which small-scale generators can contribute directly to meeting the electrical loads of the building on which they are located." This indirectly references the need for the utilities to co-operate on the integration of RE resources into the distribution network. In some countries this has been in practice for over 20 years so there is no lack of experience.

4.3.2 A considerable body of technical and safety standards related to BIPV **already exists**. There is presently international effort being addressed at co-ordinating standards and regulations into a comprehensive set ensuring worldwide safety, quality and compatibility. The same effort is being put into product, system and installation certification and accreditation. The Report should acknowledge that these "measures" already exist and only need HK application.

4.3.3 Missing:

Importantly the Report does not identify the very special needs of the HK high-rise, high-density built environment for planning legislation covering solar access + conservation, nor how this needs to be referenced in current planning applications and building regulations.

4.4.0 Promotion awareness-raising

4.4.1 The proposed short, medium and long-term promotional actions as identified in the Summary lack impetus and detail of the effect of a positively structured programme. Yet there are plenty of examples from successful national programmes round the world that have been effective for PV. cf Japan, US, Germany, Italy have all set-up and operated national programmes.

4.4 Promotion awareness-raising *continued***4.4.2 Market impact**

There is no reference in the Report to the impact of legislation on the creation of markets and the effect of a known demand enabling manufacturers to expand plant and production capacity thus reducing costs. German April 2000 RE Law demonstrates this impact. It is particularly evidenced in the expansion of PV module capacity production. Similar impact of confirmed bulk purchase over long-term period reducing utility rate is demonstrated by the SMUD, the utility of Sacramento California.

4.4.3 Slow/accelerated strategies impact on RE proportion

Summary gives no analysis of the relative impact of early or delayed actions to effect results on RE proportion. Government's role as major energy purchaser and major building stock should be leading this strategy.

Missing:**4.4.4 Charts of relative slow/fast scenarios**

Worked example on government stock applications would add credibility to the strategy/actions.

4.5.0 Targets:**Approach:****4.5.1 The top-down/bottom-up argument is irrelevant. (A market cannot exist if utilities will not permit grid-connection.) The HK Government is the major electricity purchaser. It is also major building stock-holder. Government is capable of creating a market by setting the policy and enacting legislation and applying it to its own building stock. Wind, solar thermal and solar electric are already mature industries with international suppliers. HK's small market will add to the collective worldwide market of increased scale thus reducing costs. HK + Pearl River Delta Region (50 million population) can be a significant "local" PV market.****Missing:****4.5.2 Schedules and studies of percentage build-up of RE resource by building sector**

Costed detailed studies of minimum realistic energy consumption with advanced technology. (cf Melbourne City study.see footnote Page 1). Studies of construction and services of each building sector – schools, residential, commercial, retail hotels – required for similar HK costed analysis. Studies to be completed by December 2003.

4.5.3 Note ITFUIM48 project: Latest simulation studies for building performance and electricity yield from the PV arrays indicates 7.5% of the Ma Wan School's annual energy consumption met by PV. With the school Building Energy Management System (BEMS) in operation this percentage is expected to increase to 12.44%.**4.5.4 Proposed targets:**

Present targets are far too loose and intangible and lack credibility for want of greater detail

It is necessary to have some target dates for implementation – see suggestions below

Government policy in place by 1 October 2003
Stringent energy conservation from 1 April 2004 all building sectors
Solar access and conservation (modification of CAP 123 day-lighting)
RE Legislation to take effect from 1 April 2004 – all new-build designs
(allow 5years for design to completion programme say effective 2009)
Retrofitting/renewal programme of existing stock from 1 April 2005-2022

**4.5.3 Alternative assessment by building sector
(Schools, hospitals, housing, commercial, retail, industry etc)**

- Set up targets for proportion of RE for each building on sector-by sector basis
- Assess various forecast scenarios for quantity of new-build to 2022
- Assess RE progressive retrofitting existing stock by age/status to 2022
- A) Apply targets for New-build
- B) Apply targets for Retrofitting existing stock

This method would provide a forecast of the energy demand of HK's buildings over the period and the progressive take-up of the proportion of that energy demand by Renewable Energy technologies. Inherent in this would be the reduced energy consumption arising from cost-effective energy saving investments through superior design and performance (The Melbourne Model). Since buildings consume about half the energy consumption this would help in forecasting a complex and changing demand over the twenty year period.

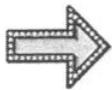
This approach provides an additional method of assessment that could be set-up through the existing Government's planning and design approval procedures and could be reasonably monitored in action.

It would need to be added to the larger picture that includes transportation and road-lighting etc from which the overall RE targets could be assessed.

end

Submission #25 - Cheung Kong Infrastructure (CKI) Ltd

Consent to releasing the information to the public has not been received from CKI.



BSEEEA22
10/03/2003 12:00

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主旨： RE: RE: 給環境、運輸及工務局廖秀冬局長的電郵 - 補充

楊亨利先生：

您好！

謝謝您的寶貴意見，我們已把閣下的意見記錄在案，在制訂政策時會一併考慮。

機電工程署署長

郭裕發 代行

Our ref.: EEO/RE/10

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機電工程署

郭裕發先生：

您好！

感謝香港政府多個部門對在下建議的回應，謹在此向諸位致意。

在細讀過“香港使用可再生能源的可行性研究報告”後，給人的感覺有如醫生在診症後，對病人說：“你患了絕症，但新藥要十多年後才有，不過亦只可救得你半條命。”還好，這醫生沒有用藥，病人可另覓獨步單方活命。

以香港目前的形勢那容再等，而是要“一步到位”的妙藥良方，不是那醫得半病不死的藥。報告上經濟效益不大的發電方法可以暫擱不理，但那最可取的風力發電，要做到像報告那樣的模式及規模也應付不了香港的用電量。況且動輒要用上延綿數里的土地，對香港來說是極度奢侈。

在下熟知香港的情況，建議的系統雖亦是以風力資源為基礎，但已將報告提出的問題全考慮在內，新系統強調將現有技術改變成規的設計。如仍是現有的模式，亦不須給香港提出什麼建議。如要快速實行，政府管治固然有規有法，但在非常時期則要行非

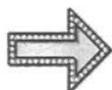
常之法，若要面面俱圓，難免縛手縛腳，拘泥於個別地點的風水，阻撓施政，到時什麼江湖神棍擺什麼陣也回天乏術，就算最好的風水，也是一潭死水。為著整體利益著想，各方是需要一點犧牲和妥協，多做些有益有建設性的事。

在下的建議各項目皆是連貫性的，一氣呵成倍見功效。這系統是極具價值，公開後，各地仿照，對某些行業定有衝擊，香港也盡失早得先機之利，為著香港能得到最大的利益，在這階段公開討論細節應是有所保留。如港府對於在下的建議仍有興趣，在下是誠意為振興香港的工作作好準備。

祝安好！

楊亨利

----- 轉呈者 BSEEEA22/LR/EMSD 於 10/03/2003 11:56 AM -----



BSEEEA22

05/03/2003 11:09 AM

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主旨: RE: 給環境、運輸及工務局廖秀冬局長的電郵 - 補充

楊亨利先生:

資料補充如下:

「香港使用可再生能源的可行性研究」第一階段研究摘要下載可於"

http://www.emsd.gov.hk/emsd/e_download/wnew/stage.pdf"

「第一階段研究摘要的常見問題」下載可於"

http://www.emsd.gov.hk/emsd/c_download/tc/re_faq.pdf"

機電工程署署長

郭裕發 代行

Our ref.: EEO/RE/10

KWOK YU-FAT

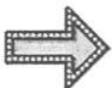
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主旨: RE: 給環境、運輸及工務局廖秀冬局長的電郵

楊亨利先生:

您好！

由於機電工程署負責執行本港的能源效益事務，故閣下於三月二日給環境、運輸及工務局局長廖秀冬女士的電郵被轉介到本署回覆部份提問。

有關使用天然資源發電，本署已於二零零零年十一月，委託了顧問公司分兩階段研究在本港推廣新能源科技及可再生能源科技的可行性。第一階段研究的目的，是評估本港大規模使用各種可再生能源的可行性，並且探討相關的法律、制度及推廣等問題。研究報告也就如何制定實施策略作出建議。第一階段的研究剛剛完成。

如欲閱覽「香港使用可再生能源的可行性研究」第一階段研究摘要，請按此處。如欲閱覽第一階段研究摘要的常見問題，則請按此處。

如閣下對第一階段的研究結果和建議，有任何想法、意見或建議，請於二零零三年四月六日或以前，向本署作出書面提交。

地址：
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機電工程署
香港銅鑼灣禮頓道111號十一樓

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多謝閣下對本港事務的關心，若閱讀第一階段研究摘要後仍有問題，請來信或電郵，再作回覆。

祝安好！

機電工程署署長

郭裕發 代行

Our ref.: EEO/RE/10

環境，運輸及工務局<?xml:namespace prefix = o ns
= "urn:schemas-microsoft-com:office:office" />
廖秀冬局長：

在下月前致函中央政策組首席顧問劉兆佳先生，提出一點改善香港現時狀況的建議，得劉先生回覆，在下建議的內容非他所專長，並指引在下將建議轉告局長。現謹在此略述建議的概要，敢請局長百忙中撥冗一顧。重點是先解決水、電、能源、環境污染、設立工業等基本問題。以不需動用大量公帑，及不損現有相關機構利益，並在短期得見成果為原則，達致有利民生，創造就業機會，刺激消費，節省政府開支及賺取外匯，增加庫房收入的目的。政府若能早日提出振興經濟的方法，外界對香港政

府的管治能力，必給予高度評價，令市民有一個快將脫離困境的正面期待，對政府及香港前景信心自然大增，定會同心協力面對短期的艱辛，置業安居的信念更堅決，被視為經濟支柱的房地產業，亦會立見起色，增加政府賣地收入，舒緩財赤的壓力。關鍵是先要獲取廉宜的電力，將現時的發電方法，改換為一個利用天然資源，生產更低成本電力的系統，使香港市民及各行業能享用廉宜電力，繼而進行多項革新。該發電系統並非一項複雜科技新發明，而是將現有技術改變成規的產品，運作清潔安全，受環境條件規限較少，極適合香港及其他缺乏能源的地區。現有的電力機構，無需大量改動設備即可應用，以香港整體經濟利益為大前題，公共事業是有必要配合政府的政策。況且各電力機構將電費減低後的邊際利潤，反因用量增多及長期大幅減少營運成本而增加。進一步是用扣除折舊及工資後，近乎零成本的電力大量淡化海水，補充短缺水源，節省向外購買用水的開支，化淡方法較舊日所用的化淡廠更有效及簡單，這亦是香港未雨綢繆能徹底解決水源問題的最理想方法。繼而用廉宜電力由水中提取氫氣加以液化，成為用之不竭的無污染環保燃料，此亦不過是香港提前催生這未來燃料而已。在省卻開採，提煉，運輸等程序，用廉宜電力製造液氫的成本，必低於石油產品。既可不假外求，亦無需大量儲存備用，減少佔用土地，更可維持價格穩定，抑制因燃料漲價引至的各種問題，推行普及化取代傳統燃料後，最終全面在各種海、陸、空交通工具上使用，減少對空氣及環境污染。使政府在醫療及環保工作上，節省人力物力。廉價的水、電、燃料供應，有助吸引工業回流及外來投資，令香港再成為一個深具競爭力的工商業城市。為開發長遠收入來源，政府可組織向外展開生產水、電、液氫配套的投資，賺取外匯，作為政府部份的固定歲入。近年德國寶馬及美國福特車廠，已成功發展液氫燃料及普通汽油兩用的汽車，寶馬車廠年前曾將此車種，在全球多個國家巡迴展出，及在部份國家留下液氫車供研究及發展。隨著香港有能力將液氫燃料普及化，及面向中國和亞洲龐大市場的有利條件下，向車廠洽商在香港設立該車種的生產線及過渡期的技術支援服務，從而可為香港市民創造大量各類型的就業機會。此外，更可考慮在香港再建立造船工業，建造新概念的輕型高速貨輪，擴展低收費快速航運業務，配合各地區碼頭及物流業的增長。在這些業務中，又可再提供大量的工作崗位，全民就業指日可待。同時又可利用廉價能源處理垃圾代替堆填及改良漁、農、畜牧等行業，使業者免受天災、蟲、病招至損失，引入優質品種，提高質量，發展外銷。

上述各項革新，政府與市民均可達成向外開源在內節流之效。以今日的科技足可掌握有餘，每項皆切實可行，絕非空中樓閣，只待一旦獲得低廉的能源配合，即可加速實現。在有賺取豐厚利潤的機會下，不難吸引資金參與發展。至於在金融及投資工具市場方面，亦可衍生不少商機，若經精確部署，更能為投資者帶來巨額利益。這一切須有一個果斷有魄力的政府主動進取協助推行，官民緊密合作，各方努力，定可使香港復甦。在下相信類同效果的發電系統，早晚終被發展出來。因此，香港趁此嚴

峻
時刻越早落實計劃，早著先機同步向多方面展開行動，樹立主導地位，則越快給香
港
帶來生機，影響深遠，成爲全球注目焦點。其成果亦肯定局長不朽的政績，不負市民
擁戴。
如蒙賜覆，請聯絡下址，在下樂意回港與局長詳細面談。順請鈞安。

楊亨利 謹上
二〇〇三年三月二日

聯絡地址：

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我的驕傲(容祖兒)，左鄰右里(李克勤)，你最紅(Twins)...
過千首手機鈴聲 點Ring都得

Comments from Air & Waste Management Association - Hong Kong Section
POTENTIAL APPLICATIONS OF RENEWABLE ENERGY IN HONG KONG

Our collective view is that there is a need for us to promote greater use of renewable energy in Hong Kong. This would help:

(a) **Tackle environmental challenges:**

(i) **Local and regional air pollution:**

Renewables like wind and solar energies emit virtually no emissions. They help alleviate our local and regional air pollution problem:

| Air Pollutants | Potential Emission Reduction by Supplying 5% Renewable for Replacing Coal-Fired Generation | |
|--|--|----------------------------------|
| | tonnes | % of emissions from power plants |
| Sulphur Dioxide | 8,150 | 14.2% |
| Particulates | 440 | 13.3% |
| Nitrogen Oxides | 7,150 | 13.0% |
| Carbon Monoxide | 190 | 7.4% |
| Non-methane Volatile Organic Compounds | 20 | 7.2% |
| Carbon Dioxide | 1,834,000 | 5.1% |

The less use of fossil fuel will also help to reduce the urban heat island effect which can also aggravate our air pollution by increasing photochemical reactions at higher temperatures. According to the Heat Island Group of the Lawrence Berkeley National Laboratory [1], for every degree Fahrenheit (0.56°C) the temperature rises above 70°F (21°C), the incidence of smog increases by 3%.

(ii) **Global issue:**

The use of renewables helps to reduce the CO₂ emissions. An aggressive renewable energy policy will, therefore, not only help to promote our international image and environmental leadership in the region, there are actually real causes for it as we are vulnerable to rise of sea level and increase of occurrence of typhoons.

(a) **Sea Level Rise [2]**

[1] <http://eetd.lbl.gov/ea/heatisland/AirQuality/>

[2] *China Climate Change Country Study Group, "China Climate Change Country Study 1999", April 2000, Tsinghua University Press.*

The sea levels of China, on average, rise at a rate of 2.6 (1.4~3.0) mm per year. It has been forecast that the sea levels in Pearl River Delta would be risen by 7.6 cm, 14.8 cm, 55.8 cm in 2030, 2050 and 2100, respectively. Quite a considerable area of land might face a great risk of flooding because of the sea level rise as there are about 1,500 sq km of land in the Pearl River Delta are having only 0.4 m or less above the grade and half of the land are within 0.9 m or below if the sea level continues to rise. About 7% and 18% of the Pearl River Delta would be flooded if the sea level rises by 30 cm under average and historical record high tide conditions, respectively. The economic implication to Hong Kong could also be very significant.

In addition, the Mai Po Wetland might also be affected as it might be quite difficult for most of the lives relying on wetlands to adapt a rise of sea level at a rate of more than 2.0 mm/year. Our resort beaches would also be shrunk as the sea level rises.

Although the Hong Kong Observatory finds that there is little change in the mean sea levels in Hong Kong, there is a report to show that there has been a long-term rise of 1.9 mm per year in the sea level of Hong Kong and a downward trend of over 4 mm per year in the vertical ground movement at the tide gauge stations. [3]

(b) Temperature rise

Although Hong Kong Observatory could not record any major change in Hong Kong's climate, a report [4] shows that the annual average, annual average maximum, annual average minimum temperatures of Southern China Coasts from 1958 to 1999 have gone up at rates of 0.188 °C/10 years, 0.191 °C/10 years, 0.245 °C/10 years, respectively, after analyzing 6 representative (Shantou, Chuan Dao, Zhanjiang, Weizhou, Haikou, Dongfang) meteorological stations' data. It seems that there is no reason to believe why Hong Kong would not be affected by the adverse impacts resulting from the global warming.

(c) Tropical Storms [2]

There would be about 1.2 typhoons landing in the Pearl River Delta region each year and it might be as high as 5. If the global average surface temperature increases by 0.25 °C, the probabilities of typhoon occurrence and landing frequency would be increased by 27% and 34%, respectively. Both probabilities

[2] *China Climate Change Country Study Group, "China Climate Change Country Study 1999", April 2000, Tsinghua University Press.*

[3] *Ref: XL Ding, DW Zheng, YQ Chen, C Huang and W Chen, "Sea Level Change in Hong Kong from Tide Gauge Records".*

[4] *C. Ren, "Climate Change in the Coastland of South China from 1958 to 1999", Meteorology (••), p.52-55, Vol 28(6), 2002.*

would be increased by 63% if the temperature increase by 0.5 °C.

(b) **Encourage development of new technologies:**

To avoid being lagged behind, we should keep pace with the international development. It also helps our entrepreneurs to introduce new technologies to Hong Kong and the neighbouring cities.

Comparing with many other countries/economies (e.g. EU's and Australian targets of renewable output of 12% by 2010), the EMSD's proposed targets are far too modest and will not help encourage advancement of these technologies in Hong Kong.

In fact, the growth of wind power is much faster than any other renewables. In 2002, the wind power capacity has increased by 28% world wide driving total wind power installation to 31,128 MW [5].

(c) **To creating new jobs:**

Unlike conventional power stations, renewable energy is more labour intensive. It is estimated that every MW of installed wind capacity creates about 60 person years of employment and 15-19 jobs [6] [7].

(d) **To boost economy:**

The American Wind Energy Association estimates that for every megawatt (MW) of wind energy produced, US\$1 million in economic development is generated [6].

As wind energy has very low operating cost, it helps stabilise the future electricity costs which is essential for maintaining our edges as a service/financial centre.

2. The proposed targets (i.e. 1%, 2% and 3% of 1999 consumption in 2012, 2017, 2022, respectively), when compared with other countries' ones, are far too conservative. I would believe that a renewable target of not less than 2% of the year's consumption in 2010 or earlier is feasible even if we discount those to be generated by wastes (i.e. landfill gas utilization and the proposed waste-to-energy facilities) and have to observe and act in accordance with the terms of the existing Schemes of Control Agreement (which are due to be expired by 2008) with the power companies through the following measures:

(a) **Starting early preparation for wind power utilization:**

[5] <http://www.ewea.org>

[6] <http://www.windenergyaction.com>

[7] *European Wind Energy Association and Greenpeace, "Wind Force 12 – A Blueprint to Achieve 12% of the World's Electricity from Wind Power by 2020"*

Among all other renewable energies, wind power is a much more matured technology that is ready for application in Hong Kong. It also takes very low lead-time (about 2 years or so) for erecting the wind turbines. Priority should be given to wind power in view of its compatible cost with the conventional ones and technical maturity. We can make use of the coming 3 or 4 years for setting up the large scale wind farms so that electricity from wind for supplying about 1% of the demand can be made available as soon as the Schemes of Control Agreement expire.

(b) **Cooperating with the Guangdong on joint exploitation of wind power:**

To have a more speedy achievement of a more aggressive target, we should not only explore our own indigenous resources but to co-operate with our neighbours, in a very similar as we did for the nuclear power and pumped storage.

Wind power should also be given as the priority as other renewables are either fully utilized (e.g. small hydro) or too expensive (e.g. solar). In fact, Guangdong has already set up 67.5 MW wind turbine units in Shanwei and Nan'ao and planned to have 300 MW units by 2005. It would be possible and desirable for Hong Kong to ask for power companies to either generate or purchase from Guangdong a certain percentage of the electricity to meet 1% or more of local consumption starting from 2008 onwards. It is a golden opportunity for Hong Kong to invest and cooperate with our neighbours. According to the estimate, Guangdong would have about 7500 MW – 10,000 MW exploitable wind power [8].

[c] **Waste-to-Energy**

The EMSD's proposed target of 1% (0.7-1.9%) of the electricity demand from waste-to-energy sources, we should be able to establish a target to supply 3% or more of the electricity by renewables in 2010. In view of the very rapid development on renewable energy technology, this and other targets for more distant future should be reviewed periodically, say every 2-3 years."

[8] *Zhi Shiqun and Qian Guangming, "The Analysis and Calculation of Wind Energy on the Coastland of Guangdong", Meteorology (••), Vol 27(5), p.43-46, 2002.*



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5 April 2003

Our Ref : YYL/03066/j1

Electrical and Mechanical Services Department

Energy Efficiency Office
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Causeway Bay
Hong Kong

Dear Sirs,

**EXECUTIVE SUMMARY
STUDY ON THE POTENTIAL APPLICATIONS OF
RENEWABLE ENERGY IN HONG KONG**

After brief reading of the Stage 1 Study Executive Summary of the captioned, we wish to comment as follows :

1. We fully support the conclusions.
2. We welcome the recommendations.
3. We believe the government should first establish a long-term formal policy on the issue, and should work with the power companies to establish a dialogue about the creation of the necessary enabling conditions.
4. The actual implementation of the recommendations should be carefully carried out based on profound studies and investigation of all conditions in Hong Kong.

Yours faithfully,
For and on behalf of
RANKINE & HILL (HONG KONG) LIMITED

Y. Y. Leung
Director

