

Climate Change: The spotlight on renewables

Renewable Energy Development

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2 November 2007

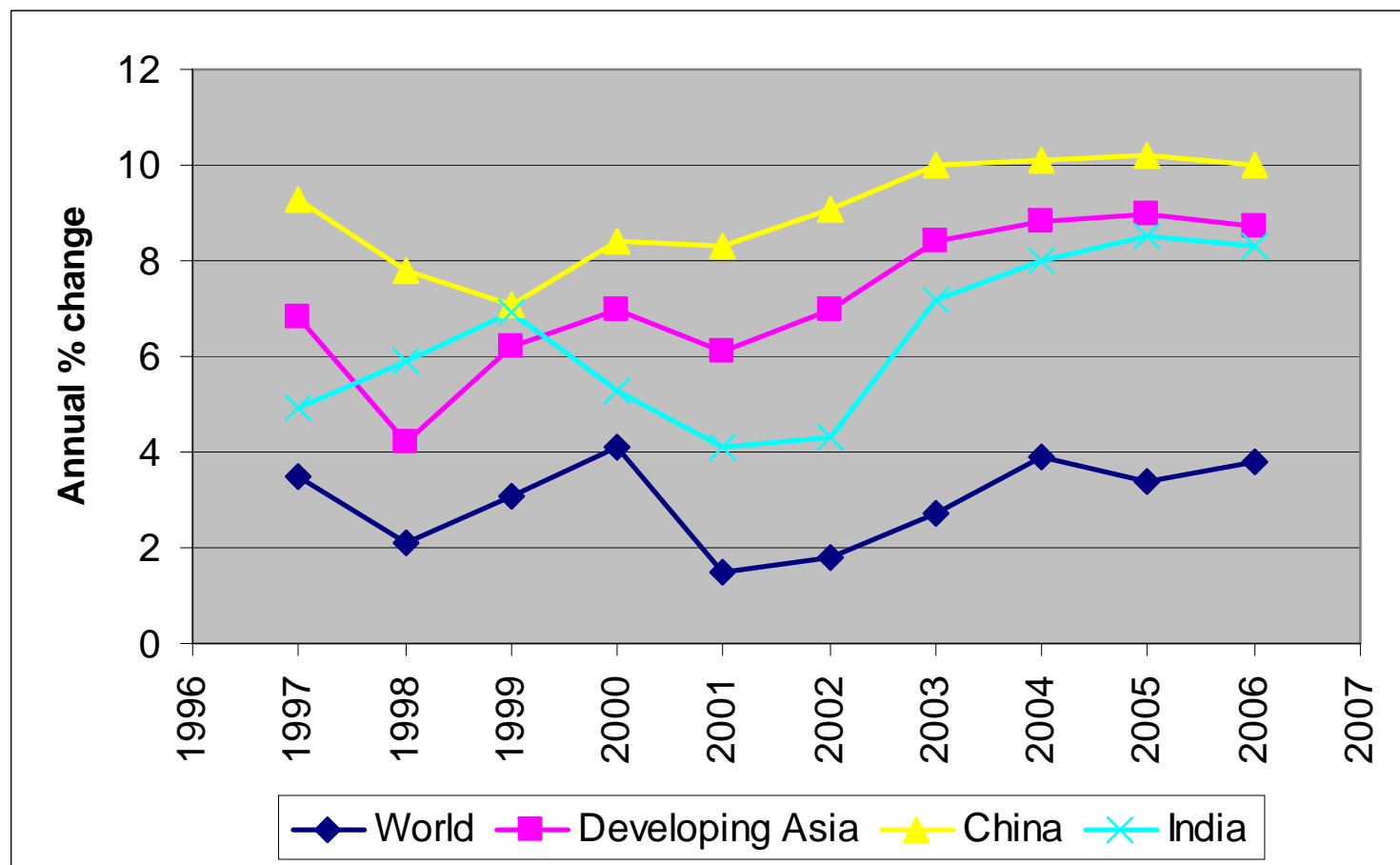


GDP Growth by Region

China's GDP grew by 10% annually and India had an over 7% annual growth in the past 4 years

The trend is expected to continue in the foreseeable future

To fuel the strong economic growth, reliable electricity supply is required

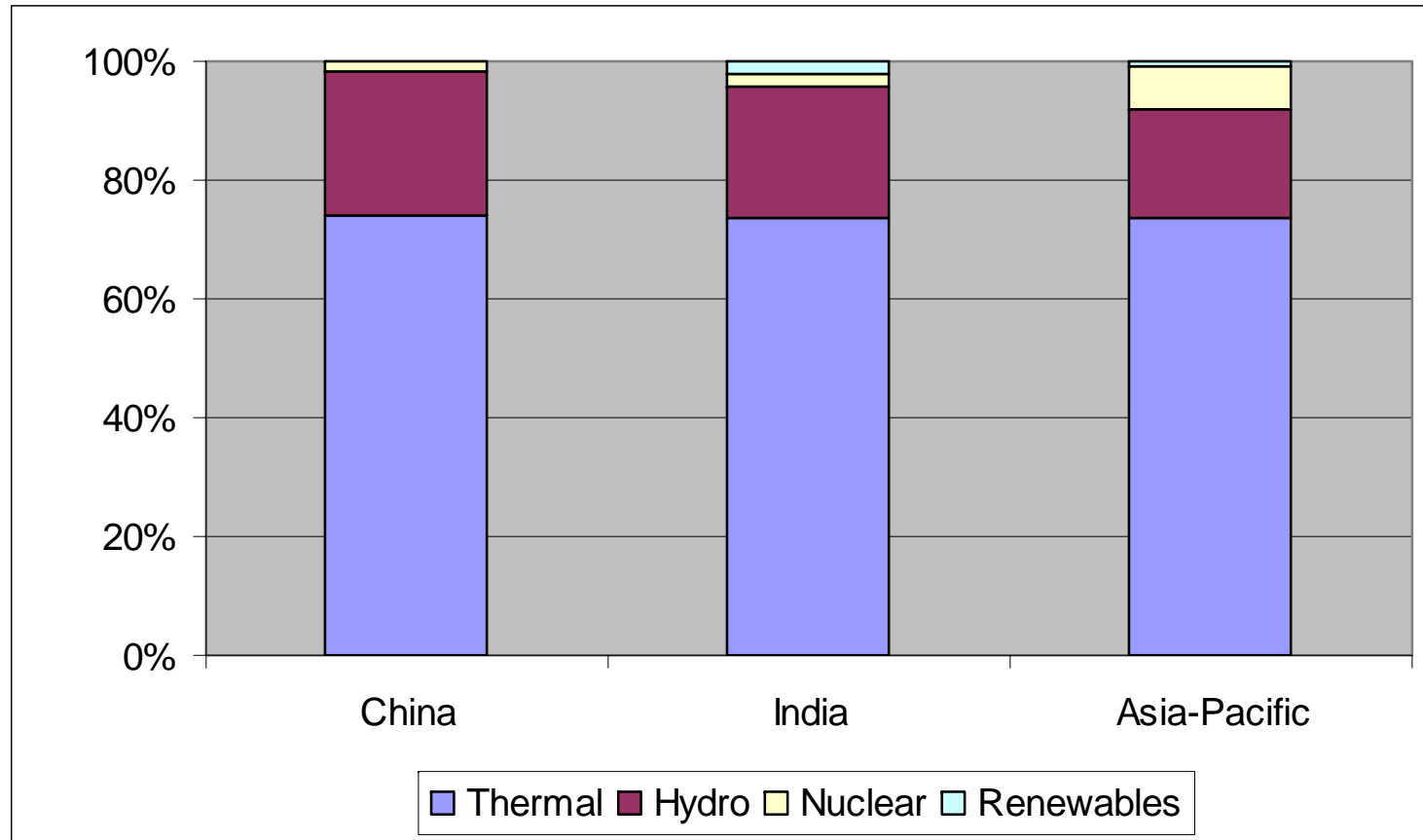


Installed Capacity by Type

Uneven mix of energy sources

Over 70% of the generation capacity in the region are thermal power plants (mostly coal-fired)

Renewables make a small contribution of overall power demand



Climate Change

❖ *The average earth's surface temperature has been increased by 0.74 °C since the late 1800s. It is expected to increase by another 1.8 °C to 4 °C by the year 2100.**

❖ **Impacts:**

- ➔ Extreme weather
- ➔ Drought
- ➔ Rising sea level
- ➔ Desertification



❖ **The result of human activities by....**

❖ **Not only the economic activities in developed economies, but also the current and future growth in developing countries such as China and India.**

* United Nations Framework Convention on Climate Change

Urgent Need for Combating the Challenges

- ❖ **Now is the critical timing to address the issues**
- ❖ **The real challenge is how to:**
 - **Continue economic growth in a sustainable manner**
 - **Minimise the global climate change impacts**
- ❖ **Hybrid solutions:**
 - **Using fossil fuels more efficiently**
 - **Energy efficiency**
 - **Renewable energy**
 - **Nuclear energy**
 - **Carbon capturing**
- ❖ **Renewable energy is attractive:**
 - **Reduce/avoid emission of greenhouse gases**
 - **Provide sustainable and diversified energy supply**

Availability of RE Resources

Resources: Wind in China

Potential of Wind Resources:

Onshore 250 GW

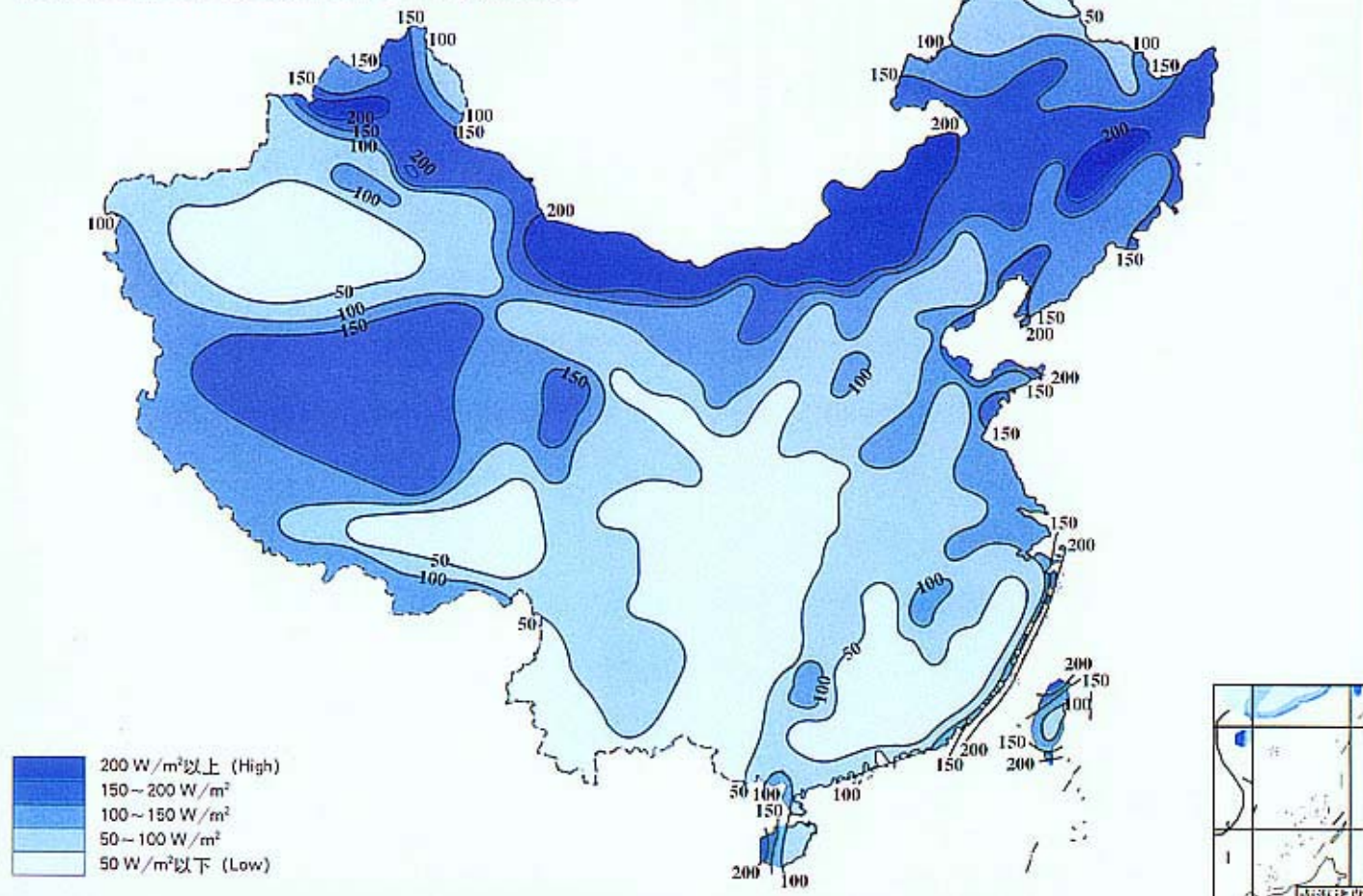
Offshore 750 GW

Concentrated in the northern, western and coastal areas

Transmission constraints and grid stability

中国有效风功率密度分布图 (W/M²)

Distribution of effective wind power density in China



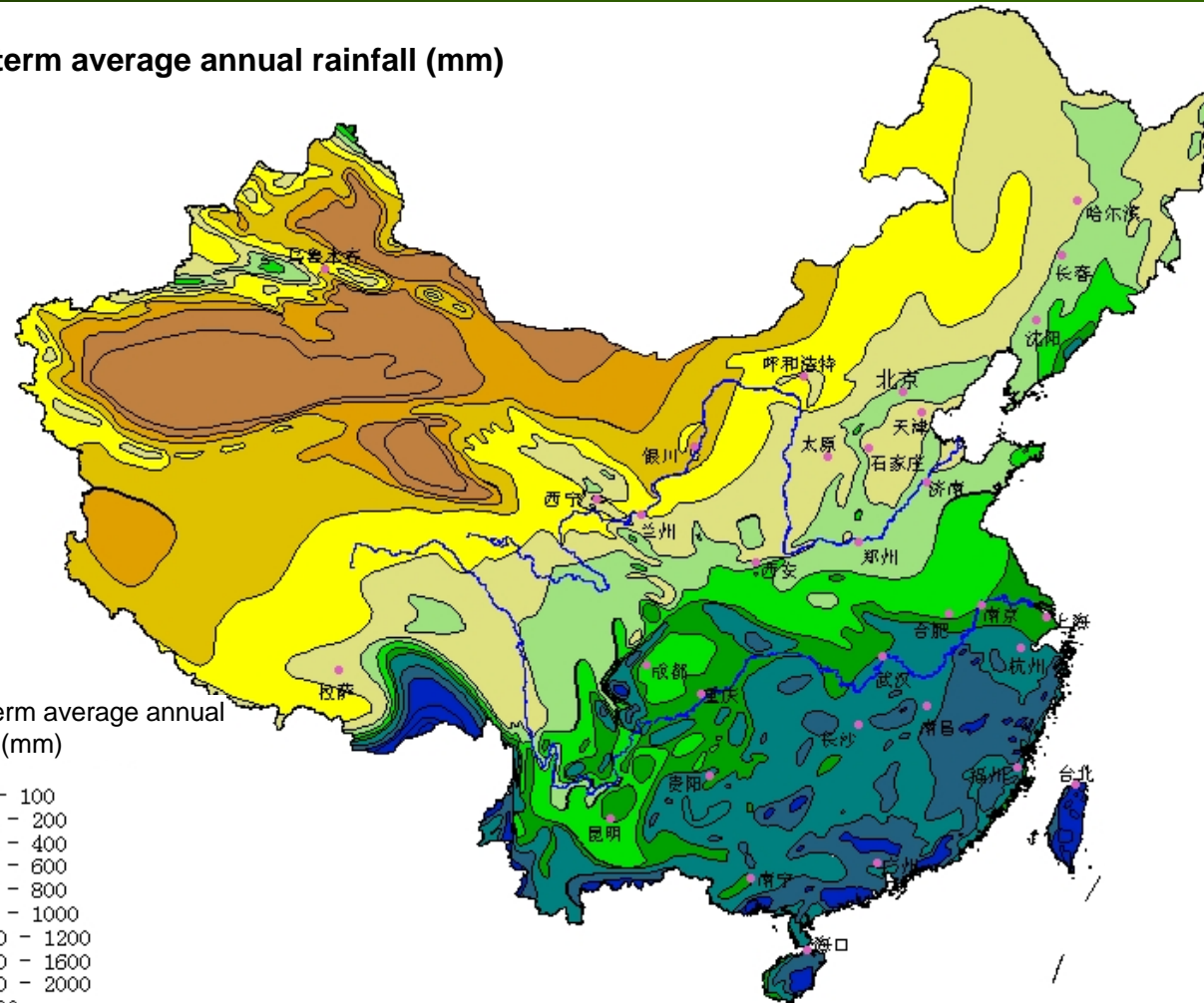
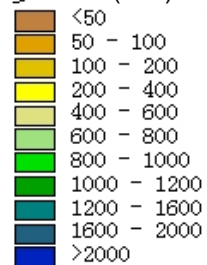
Resources: Hydro in China

Exploitable capacity 400GW, the largest in the world

Existing 100GW with 35GW from small hydropower stations

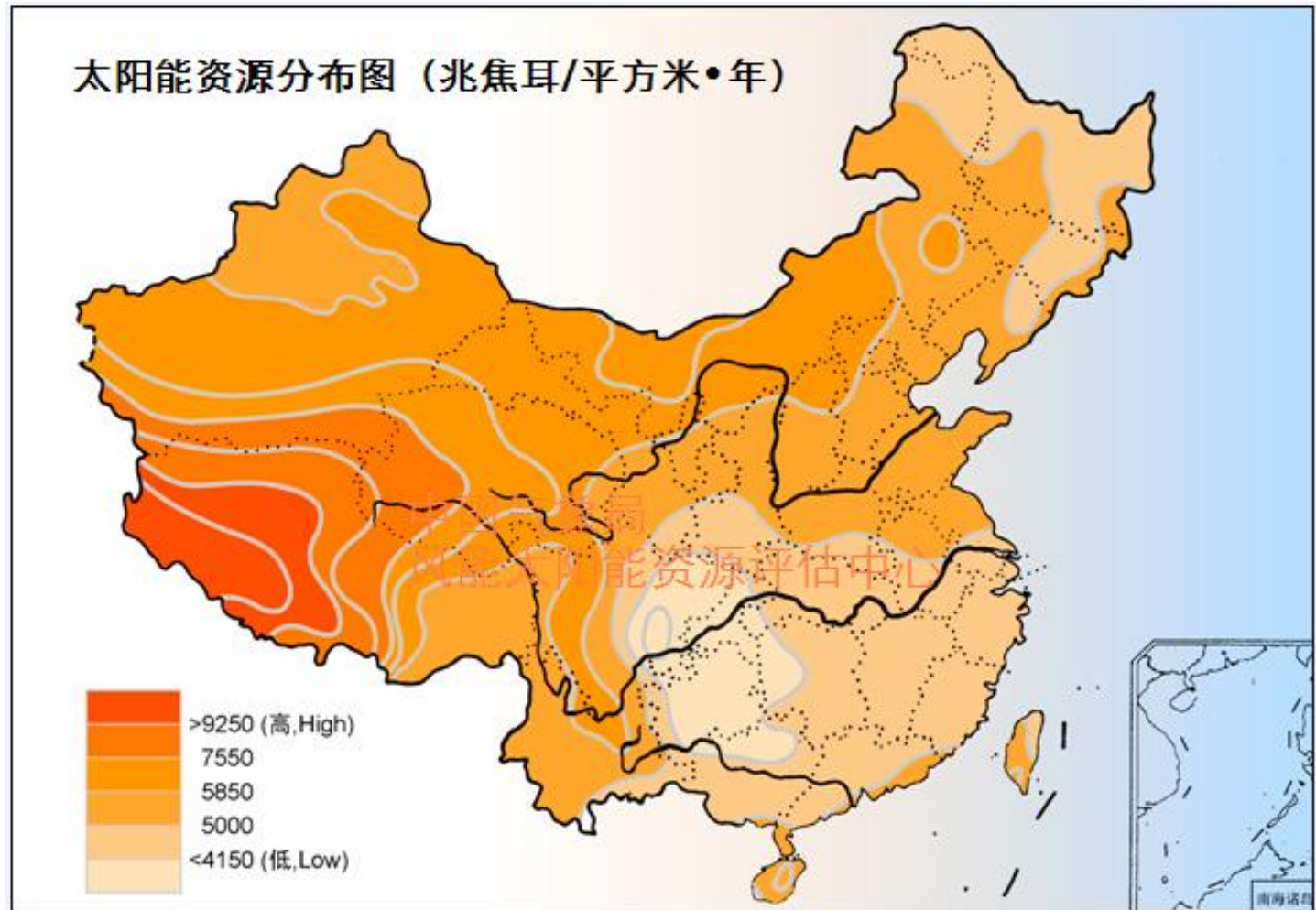
Long-term average annual rainfall (mm)

Long-term average annual rainfall (mm)



Resources : Solar Power in China

Solar power concentrates on the far west, away from load centres



Challenges of Developing RE

**RE is clean
and
environmental
friendly**

BUT...

- ❖ Uncertain/intermittent resources
- ❖ Lower utilisation hours
- ❖ Smaller or lack of economy of scale
- ❖ Shortage of equipment supply (wind)
- ❖ Technology still being developed (solar)
- ❖ Higher capex
- ❖ More stringent environmental constraints
- ❖ Governmental supports
- ❖ Public/stakeholder's opinions
- ❖ Availability of project financing

The Current Situation

- ❖ **Considerable technology advancement achieved in the last 20 years**
- ❖ **Renewable energy is increasingly competitive with conventional power generation**
- ❖ **For instance, wind energy is:**
 - **Rapidly developing in mainstream power sources in some of the developed and developing countries**
 - **With over 60,000 MW installed capacity**
- ❖ **Small hydro more developed; biomass, wind and solar energy all offer large unexploited potentials**



CLP Renewables - Mission and Objectives

Manifesto on Air Quality & Climate Change -

commitment to
renewables
development

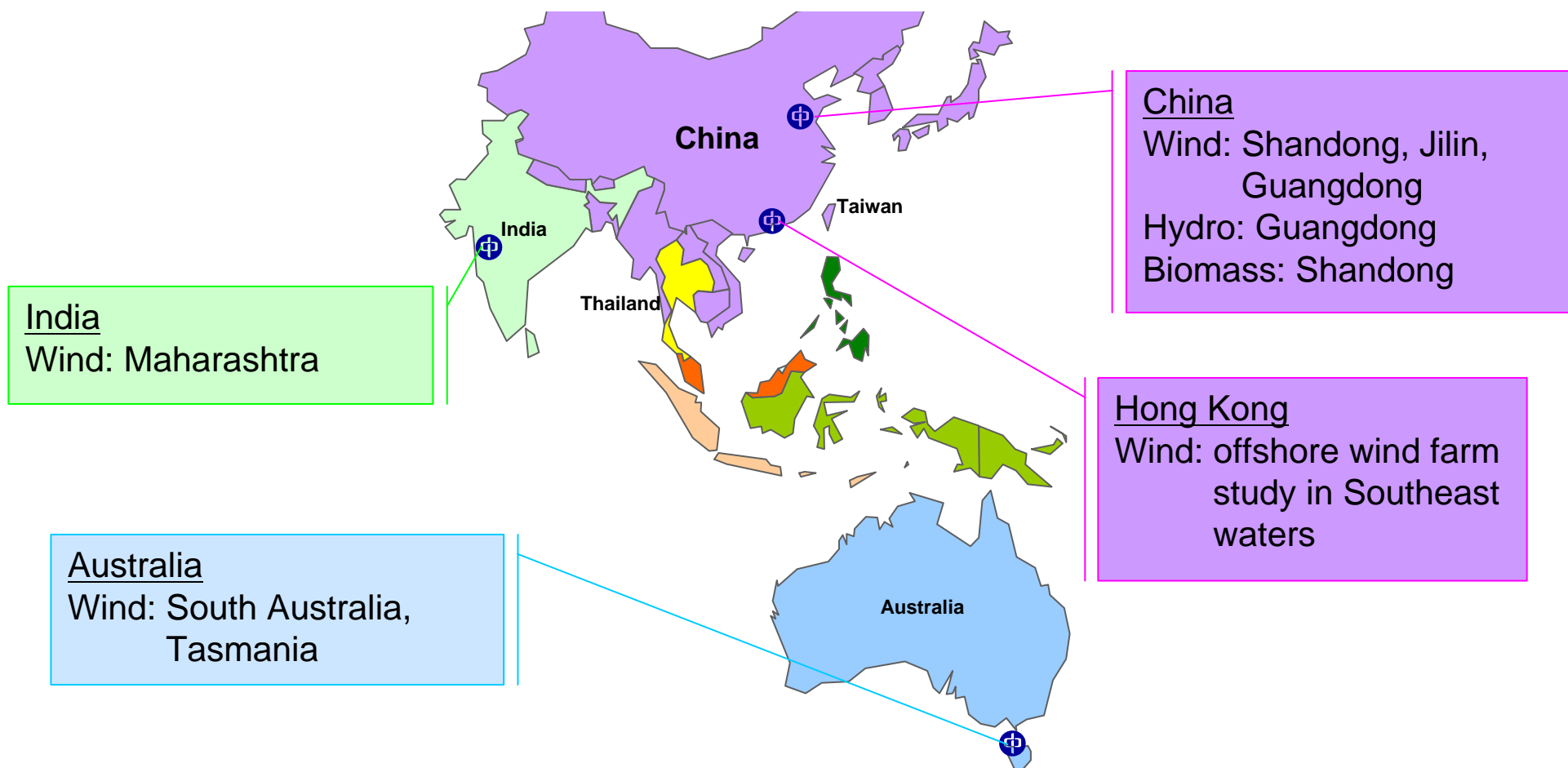
Mission – *To be a leading renewable energy player in Asia Pacific*

Objectives

- ❖ **5% Renewables Target** – To meet with our commitment of 5% generating capacity from renewable energy sources by 2010
- ❖ **Meaningful Return** – To build a successful renewables portfolio across Asia Pacific generating meaningful return to CLP
- ❖ **Potential long term hedge to carbon exposure** – a source of carbon credit to offset exposure in CLP's international coal portfolio

CLP RE in Asia-Pacific Region

Expanded renewables portfolio by type and by geography



CLP-Huaneng Changdao Wind Project

CLP's first greenfield renewable energy project

❑ Stake

- ⇒ A joint venture in which CLP holds a 45% stake was formed with China Huaneng Group in December 2004.

❑ Finding a good partner is critical

❑ Project Scale

- ⇒ The 27.2MW project approximately accounts for one-third of wind power installed generating capacity in Shandong (Wind power installed generating capacity in the province: 80MW).
- ⇒ Of the 32 x 850kW wind turbine generators, 21 are installed on the North Island of Changdao and 11 on the South Island.
- ⇒ A 110kV Substation on the South Island of Changdao is connected to the Shandong power grid via 110kV underwater cable.
- ⇒ A total of 19.4km 35kV cable laid for the entire wind farm.

❑ Project operation

- ⇒ May 2006
- ⇒ Good wind resource



CLP-Huaneng Weihai Wind Project

□ Stake

- ⇒ A 2nd joint venture in which CLP holds a 45% stake was formed with China Huaneng Group in 2005.

□ Scale of the project

- ⇒ The Phase I- 19.5MW project located at a coastal town Gangxi, Rongcheng
- ⇒ 13x1.5 MW using foreign and local turbines
- ⇒ Phase 2 (50MW) under construction
- ⇒ Phase 3 (50MW) under planning

□ Ideal model for expansion

- ⇒ Same partner and team
- ⇒ Potential for higher gearing permitted due to higher capitalisation



Investment in Roaring 40s

Established in 2005, where CLP Group acquired 50% stake

A good platform for investment and partnership in renewable energy projects

A team of highly skilled executive management and specialist staff in project development, financing and asset management

❑ Strategic Partnership

- **CLP Group** - has more than 100 years of experience in the power industry, and being the largest IPP investor in Asia-pacific
- **Hydro Tasmania** – Australia largest renewable energy business, generating over 60% of country's total renewable energy
- ❑ Target to achieve a portfolio of **1000MW** by 2010, of which existing assets and late stage development projects account for almost 600MW
- ❑ Additional growth targeted primarily from China, further Australian projects and additional markets in Asia (e.g. India)

Maximize technical, commercial, and financial capability with strong local connection across Asia Pacific

Investment in Roaring 40s

□ Total Capacity (* as of 31st January 2007)

	Operation	Construction	Development	Total
Roaring 40s (Gross MW)	131	173.1	50.4	354.5
50% CLP Share (Equity MW)	49	61.5	25.2	135.7

□ Good portfolio of assets under operation and construction

e.g. (1) Woolnorth with 140MW total - 65MW (Bluff Point) in operation and 75MW (Studland Bay) in construction phase

- Availability above 97% for last 2 years.
- Achieved capacity factor up to 60% in some months
- 3MW WT in Studland Bay will be the largest onshore WT in southern hemisphere

□ Strong pipeline of projects, including those in other Asia pacific countries

e.g. Rongcheng project (partnership with Guohua), Shuangliao project (partnership with Datang) in China and Maharashtra wind project in India



CLP Renewables Portfolio

Operation



Huaiji, Guangdong
105.6MW hydro
(88.6MW in operation)



Woolnorth Bluff Point, Australia*
65MW wind



Cathedral Rocks, Australia*
66MW wind



Changdao, Shandong
27.2MW wind



Weihai I Shandong
19.5MW wind



Shuangliao, Jilin*
49MW wind



Woolnorth Studland Bay, Australia*
75MW wind



Rongcheng, Shandong*
49MW wind

Construction

* Thru' Roaring 40's



Weihai II, Shandong (2007)
49.5MW wind



Nanao, Guangdong (2007)
45MW wind



Khandke, India*
(2007)
50MW wind



Datong, Jilin* (2008)
49.5MW wind



Hekou, Lijin, Zhanhua, Shandong* (2008)
wind
3 x 49.5MW



Samana, India (2008/09)
101MW wind



Hailing Island, Guangdong (2008)
22MW wind

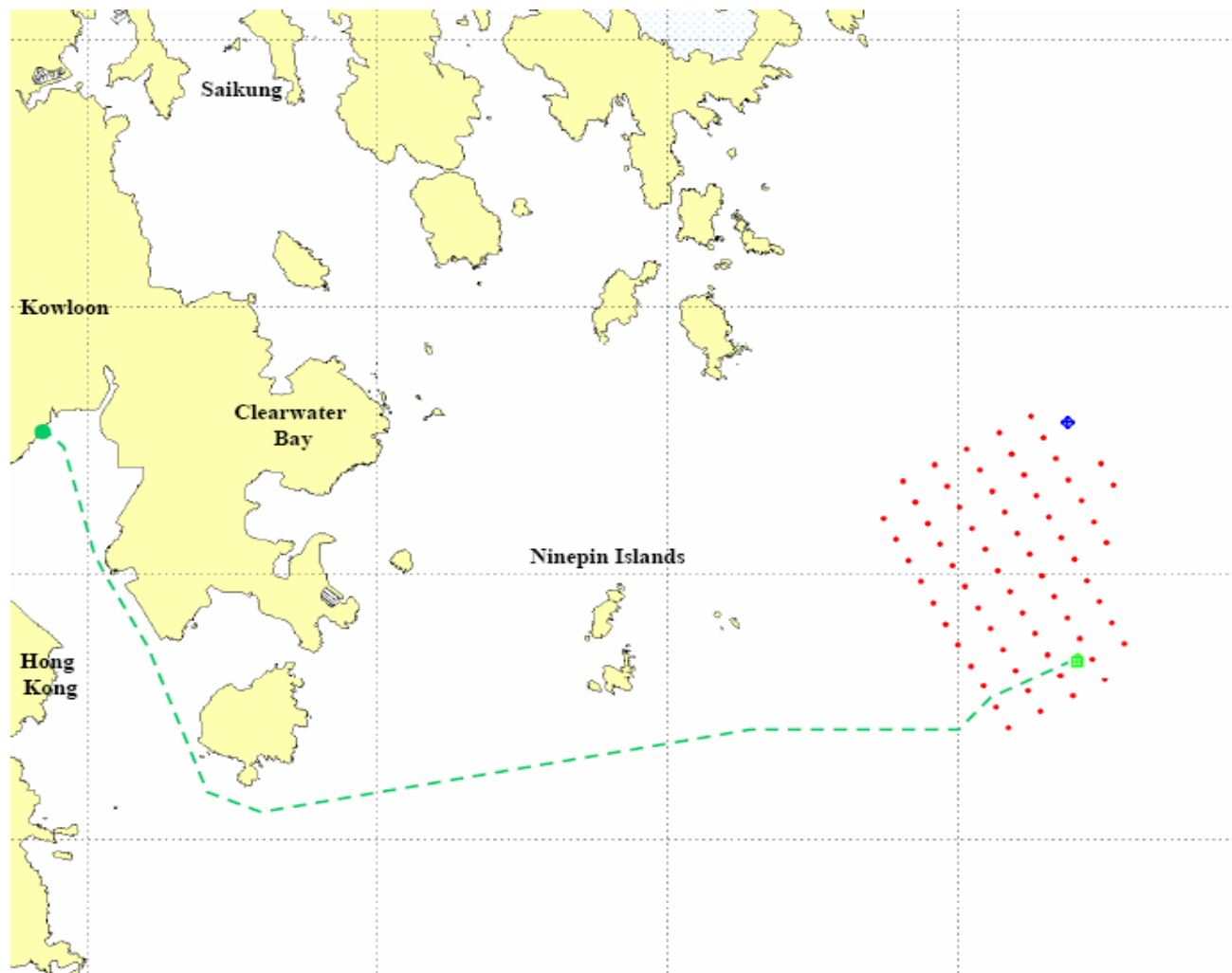


Boxing, Shandong (2008) Equivalent to 14MW biomass combined heat & power

Total 462MW (Equity) as of 30 Sep 2007, approx 4.6% of total generating capacity

Renewable Energy in Hong Kong – Offshore Wind Farm

- ❑ 150-200MW (depending on 2.3MW or 3MW turbine model)
- ❑ 67 turbines
- ❑ 1.5-2% of CLP-HK's capacity (1-1.5% of HK total)
- ❑ Submarine power cable to Tseung Kwan O grid connection
- ❑ ~9 km east of Clearwater Bay peninsula
- ❑ Feasibility study and EIA are in progress



Photomontage from Clearwater Bay Country Park



Global Renewable Energy Award

❖ “Corporate Developer of the Year”

by Euromoney and Ernst & Young Global Renewable Energy Awards 2006



More Awards to CLP

- ❖ CLP named “Best in Eco-energy Development” in the 2007 Prime Eco-Business Awards



- ❖ Changdao wind farm received “China Electric Power Industry’s Best Quality Engineering Award 2007”
Total 35 power projects awarded; only 2 wind farms incl. Changdao and Huaneng’s Taobei wind farm in Jilin



中国电力建设企业协会文件

中电建协〔2007〕17号

关于表彰 2007 年度 中国电力优质工程的通知

各会员及有关单位：

为贯彻国务院颁发的《质量振兴纲要》和《关于加强基础设施建设质量的通知》精神，推动电力建设企业加强质量管理，提高工程建设质量和投资效益，中国电力建设企业协会依据《关于评选 2007 年度中国电力优质工程的通知》（中电建协工〔2007〕1号）文件精神，组织了 2007 年度中国电力优质工程评选工作。经过严格的预审、工程现场复查、评审、公示等程序，现决定，授予浙江国华宁海电厂新建工程（4×600MW）等 35 项工程 2007 年度中国电力优质工程奖，并予以表彰（名单见附件）。

联系单位：中国电力建设企业协会

地 址：北京市宣武区白广路二条 1 号



Thank You !

