New Directions in Renewable Energy Resources

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1. Introduction

Renewable Energy Resources

- Solar energy
- Wind energy
- Biomass energy
- Hydro energy
- Geothermal energy
- Ocean energy (mainly wave, tidal)

Growing Importance of RE

- United Nations World Summit for Sustainable Development, 2002

  -> Johannesburg Plan of Implementation calls for governments to, “with a sense of urgency, substantially increase the global share of RE sources with the objective of increasing its contribution to total energy supply”

Growing Importance of RE

- International Conference for Renewable Energies Bonn 2004
  -> Political Declaration
- Beijing International Renewable Energy Conference 2005
  -> Beijing Declaration on Renewable Energy for Sustainable Development

2. Developments in RE Utilization in the World

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RE in World Energy Supply

Fuel Shares in World Total Electricity Production, 2003

Oil	7%
Coal	40%
Gas	19%
Nuclear	16%
Renewables	18%

Hydro	16%
Combustible renewables and waste	1%
Geothermal	1%
Solar	
Wind	
Tide/wave/ocean-current	

Share of non-hydro renewables in world electricity production is still low, but will be growing

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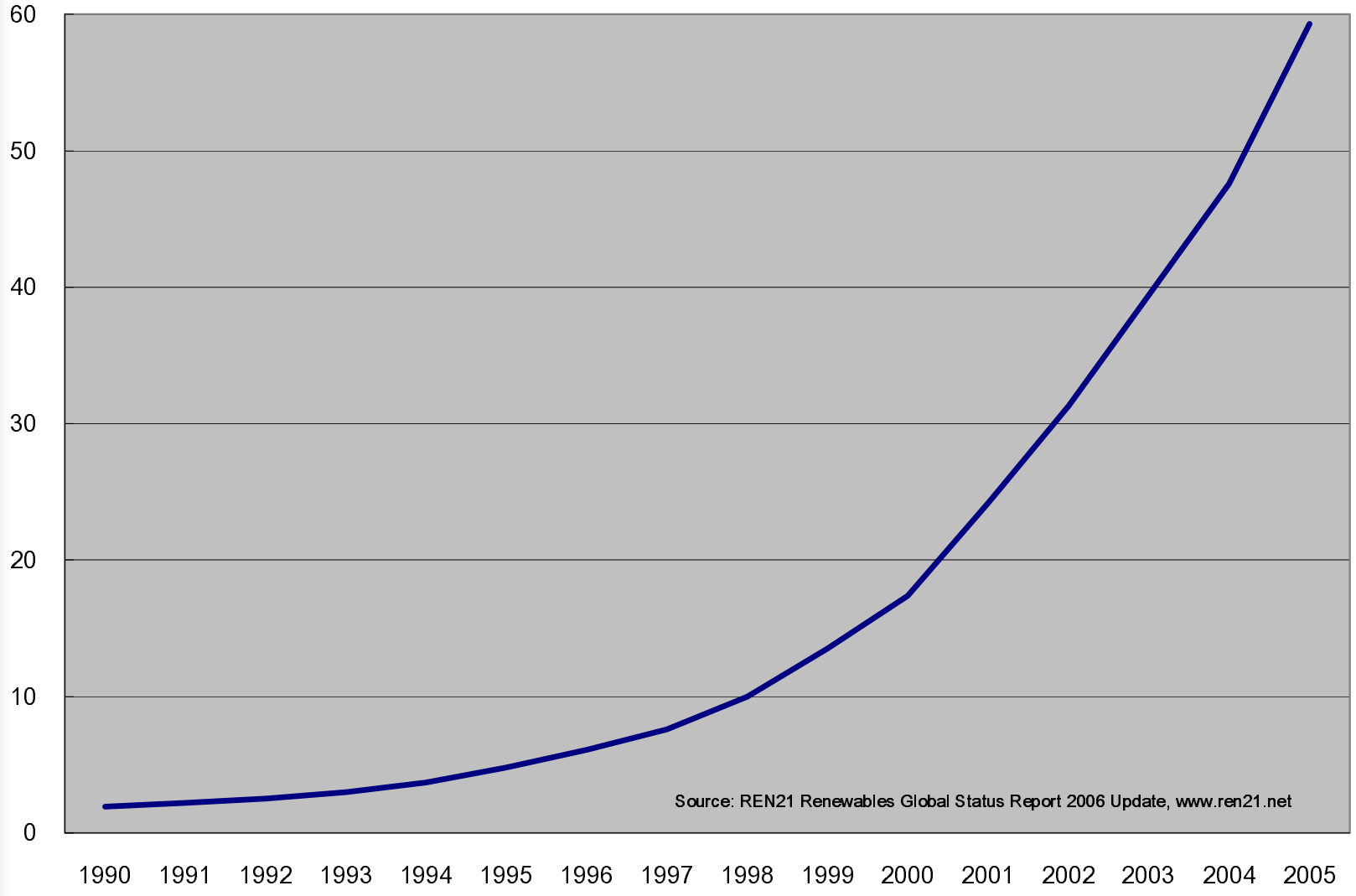
Wind Power Existing World Capacity (GW)



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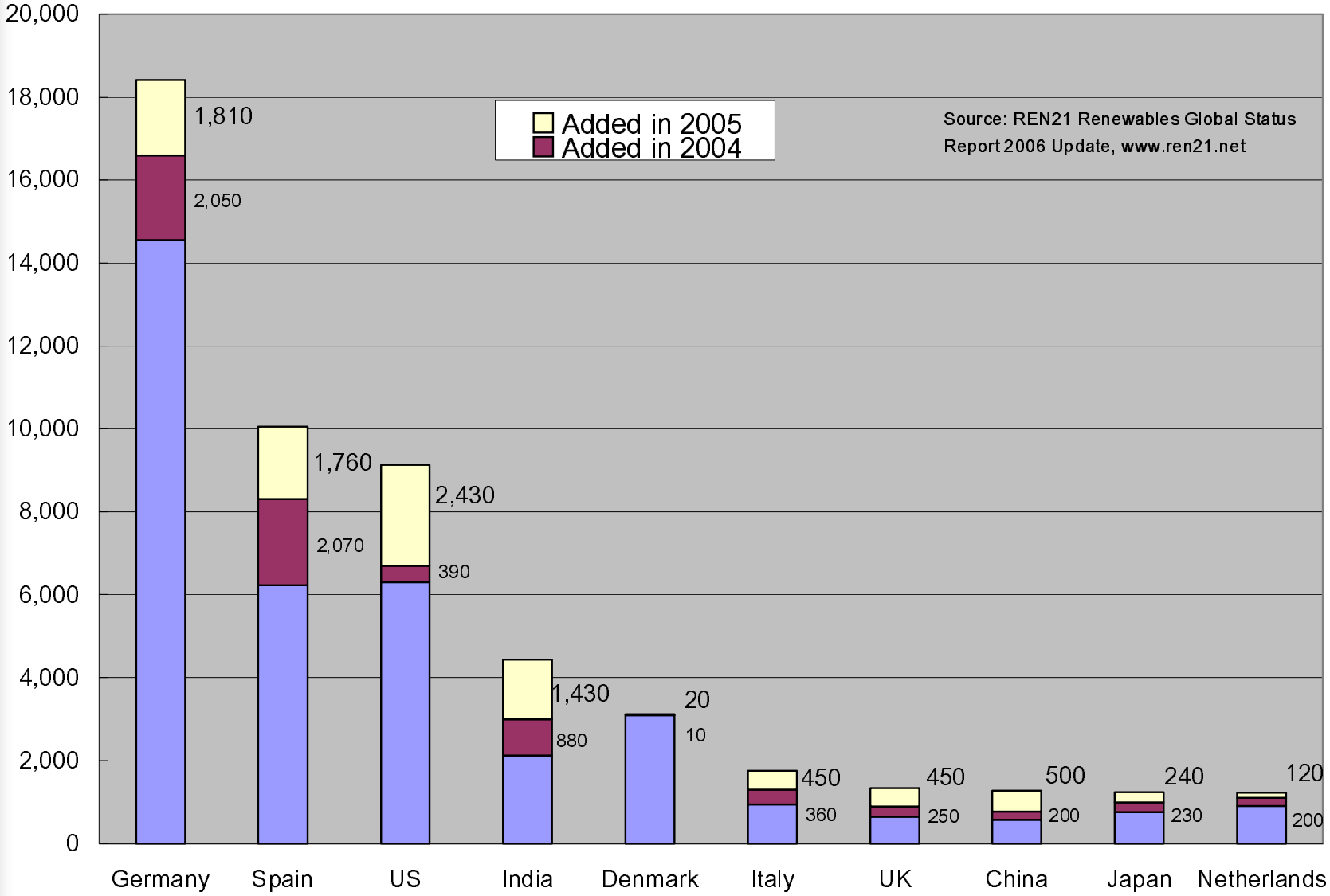
Wind Power Capacity (MW), Top Ten Countries, 2005



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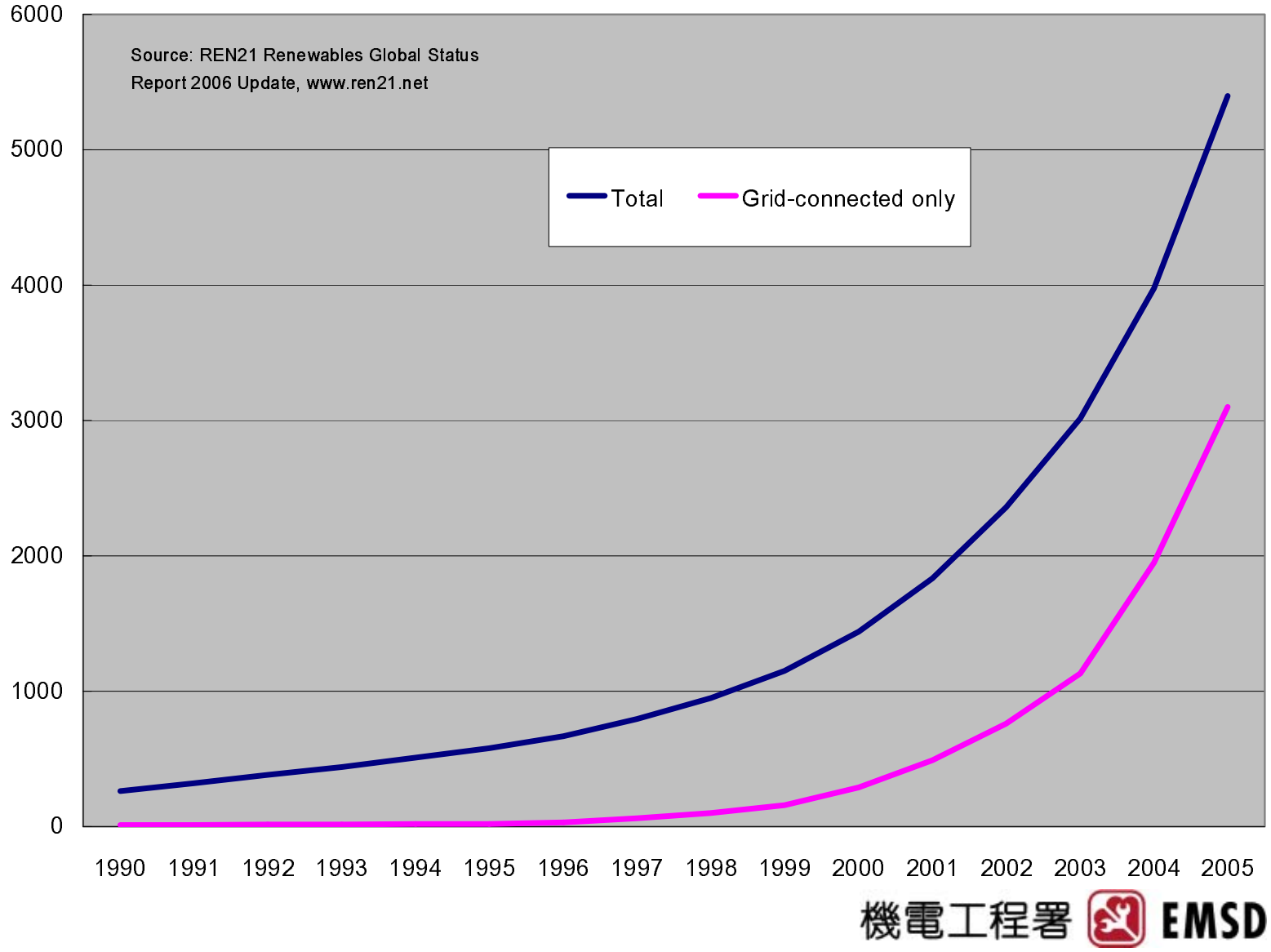
Solar PV Existing World Capacity (MW)



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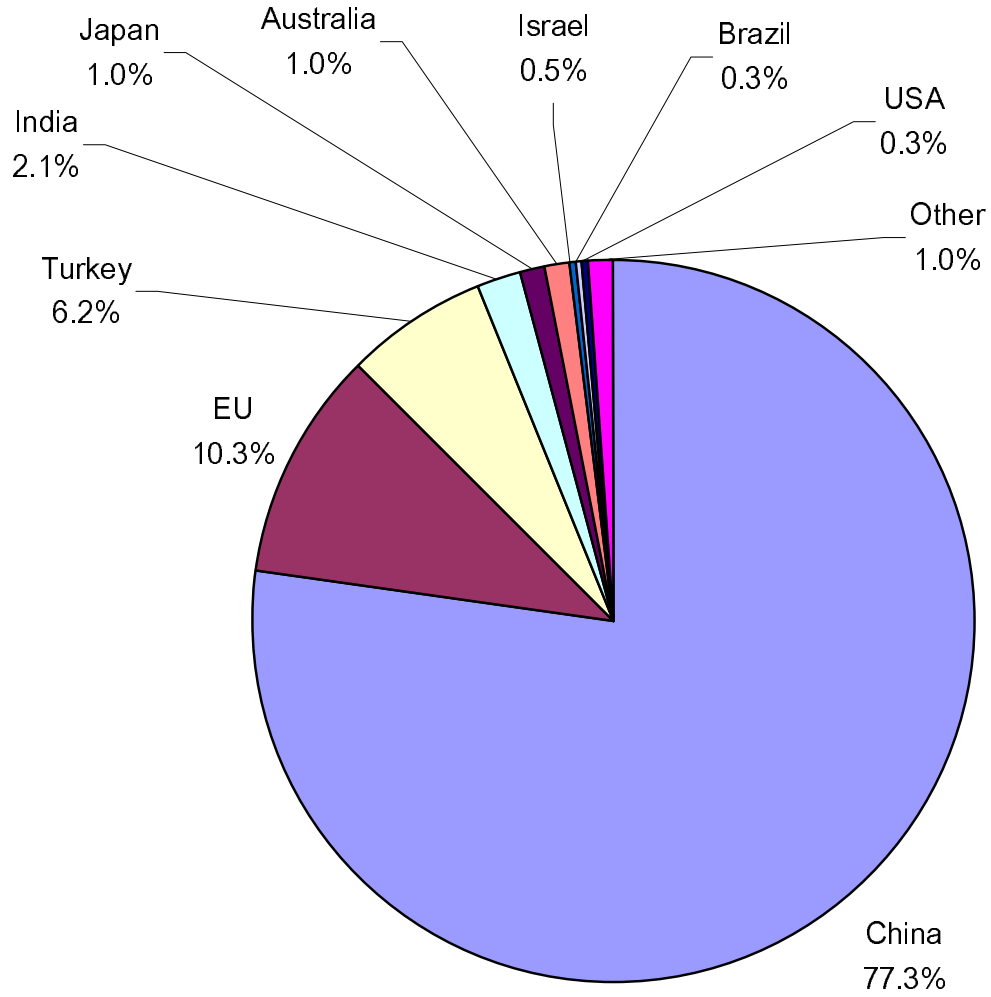
Solar Water/Space Heating Capacities Newly Added in 2005 (13GWth Added)



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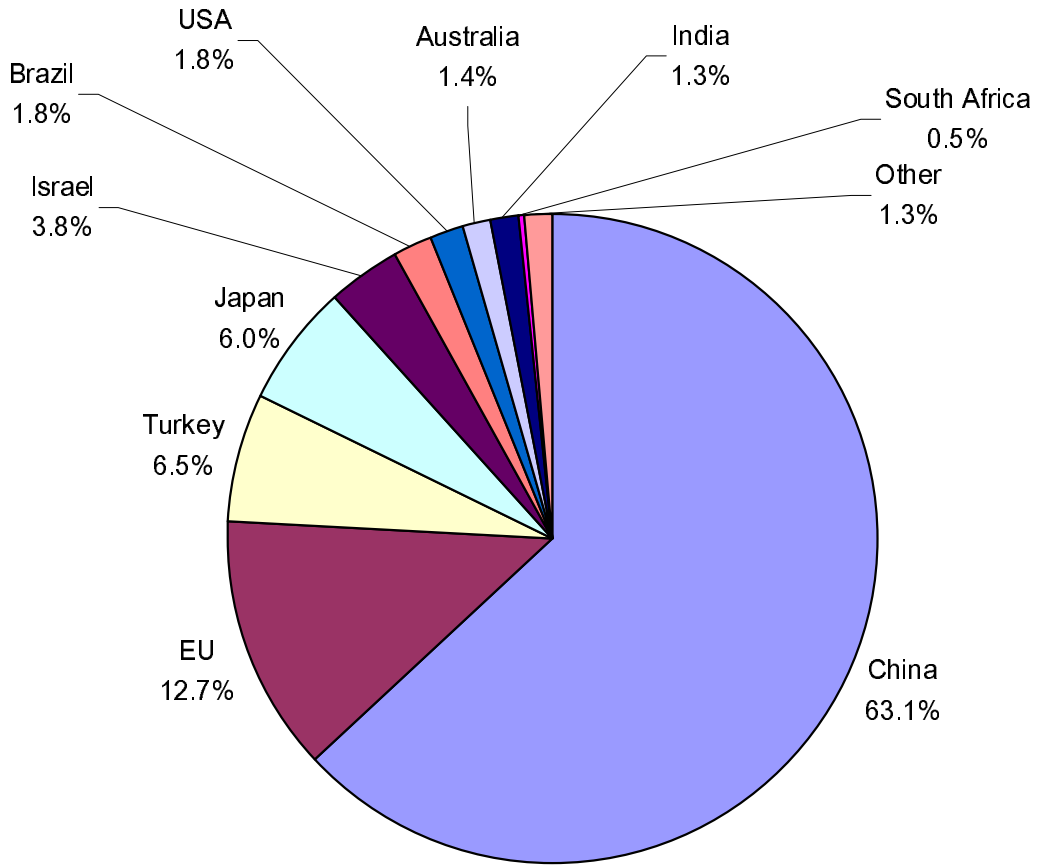
Source: REN21 Renewables Global Status Report 2006 Update, www.ren21.net

Solar Water/Space Heating Capacities Cumulative Total in 2005 (Total 88GWth)



Source: REN21 Renewables Global Status Report 2006 Update, www.ren21.net

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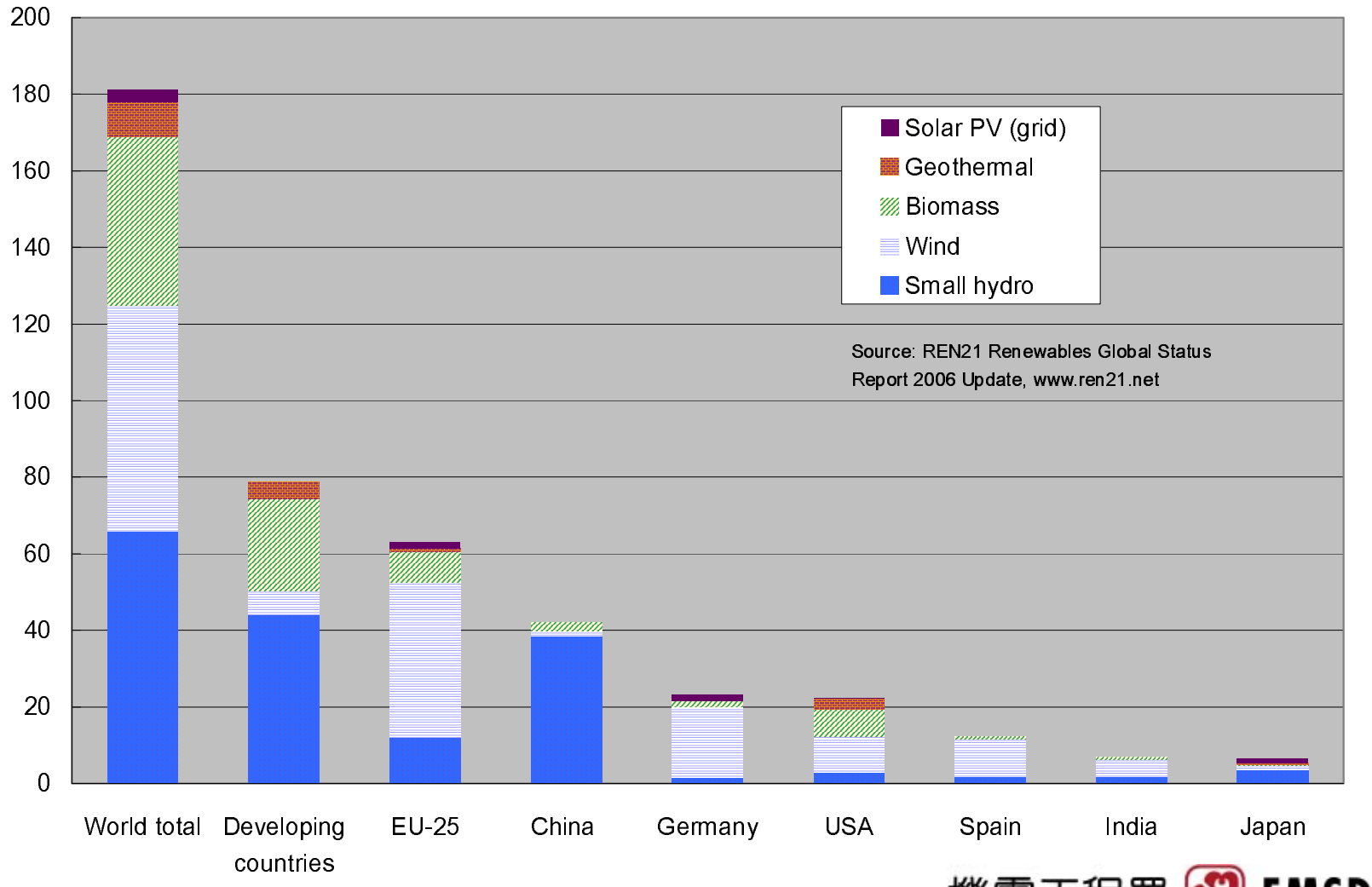
Renewable Power Generating Capacities (GW) in 2005, excluding large hydro



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Countries with Renewable Energy Targets

- Total 49 countries with policy targets
- 25 EU countries
- 24 non-EU countries (Australia, Brazil, Canada, Croatia, China, Dominican Republic, Egypt, India, Israel, Japan, Jordan, Korea, Malaysia, Mali, New Zealand, Nigeria, Norway, Pakistan, Philippines, Singapore, South Africa, Switzerland, Thailand, United States (for some states))

Countries with Renewable Energy Targets

- UK aims to have 10% of electricity supply to come from renewable sources by 2010.
- Mainland aims to increase total installed capacity of wind power to 5GW, and total installed capacity of biomass power generation to 5.5GW, within the 11th Five-year Plan Period

Cities with Renewable Energy Targets

- A number of cities have decided to purchase green power for municipal government buildings and operations (e.g. Portland in Oregon, Chicago, Los Angeles, London)

Cities with Renewable Energy Targets

- A number of cities have set targets on renewable energy or specific types of renewable energy technologies, for the whole city and not just the municipal government.
- Tokyo aims to increase renewable energy use in the city to 20 percent of all energy supplies by the year 2020.

Cities with Renewable Energy Targets

- London's RE targets aim to generate at least 665 GWh of electricity (equivalent to 2% of the year 2000 electricity consumption) and 280 GWh of heat by 2010.
- Other examples are: Adelaide (Australia), Barcelona (Spain), Cape Town (South Africa), Daegu (South Korea), Freiberg (Germany)

Sustainable Development Strategy

- Published in 2005
- Set a target of having between 1% and 2% of HK's total electricity supply met by power generated from RE by 2012

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3. Developments in Selected RE Technologies and Applications in Hong Kong

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RE Technologies Having Potentials for Application in Hong Kong

- Solar
- Wind
- Energy-from-waste

Solar Water Heating Technology

- Flat plate type, evacuated tube type
- Heat-pipe evacuated tube type now becoming more popular

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Solar Water Heating Technology

Largest solar water heating installation in Hong Kong - Sheung Shui Slaughter House, with 882 square metres of solar collectors

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PV Technology

- Main types in the market
  - Poly-crystalline silicon
  - Mono-crystalline silicon
  - Amorphous silicon

Examples of Applications of PV

- Solar-powered lamp pole
- PV power supply systems for remote villages, equipment in remote locations
- Wind/solar hybrid systems for remote locations
- Building-integrated photovoltaic (BIPV) systems
- PV power station

Local PV Installations

- Total installed peak capacity for government projects about 770 kW
- Many small-scale standalone systems
- Larger systems are mostly installed on buildings, using PV panels or PV glass units

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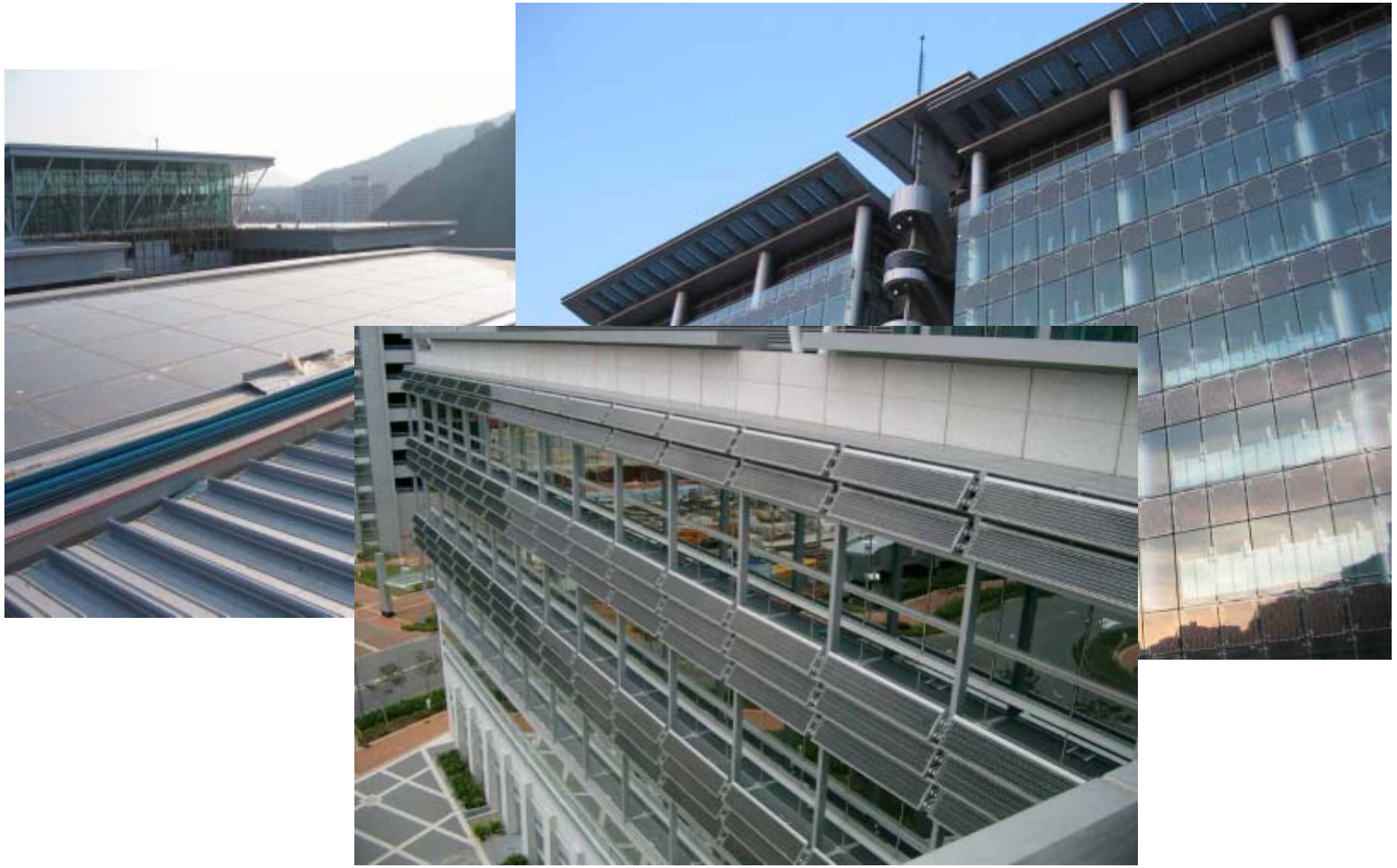
Science Park – 198 kW



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Castle Peak Hospital – 30 kW

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Penny's Bay Fire Station and Police Post – 85 kW

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Wanchai Tower PV System

- Constructed in 2002 as a grid-connected PV pilot project of EMSD
- Performance monitored from April 2003 to March 2004
- Report available for download from EMSD website

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Wanchai Tower PV System

Total PV Panel Area	500 m^2
Total Installed Capacity	55 kW
Orientation and tilt angle	South & 10^o
No. of Sub-systems	3
Grid connection	Yes

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EMSD Headquarters PV System

- Largest grid-connected PV installation in HK
- Over 2,300 PV panels installed – 350 kW
- Rack type and skylight type

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EMSD Headquarters PV System

- Target annual electricity yield is 300 to 400 MWh
- Performance monitoring in progress since September 2005

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Small Wind Turbines

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Large Wind Turbine

- 800 kW wind turbine at Lamma Island, by Hongkong Electric
- Another large wind turbine will be constructed by CLP Power in 2007

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Developments in Wind Turbine Technology

- More and more offshore wind farms
- Steady increase in size, with 5-6 MW machines under testing by several manufacturers
- Variable speed technology, gearless designs, improvements in blade design to provide higher energy yield and reduce noise

Energy-from-waste Installations

- Landfill gas power generation
  - Total generation capacity about 7.4 MW
- Landfill gas for heating
  - Heating fuel for the production of towngas
- Biogas power generation and heating at sewage treatment works

Some Measures to Support RE Development in Hong Kong

- Adoption of RE technologies in government projects and installations
- Technical Guidelines on Grid Connection of Small-scale RE Power System
- Portal web-site to provide information on RE technologies (under development)

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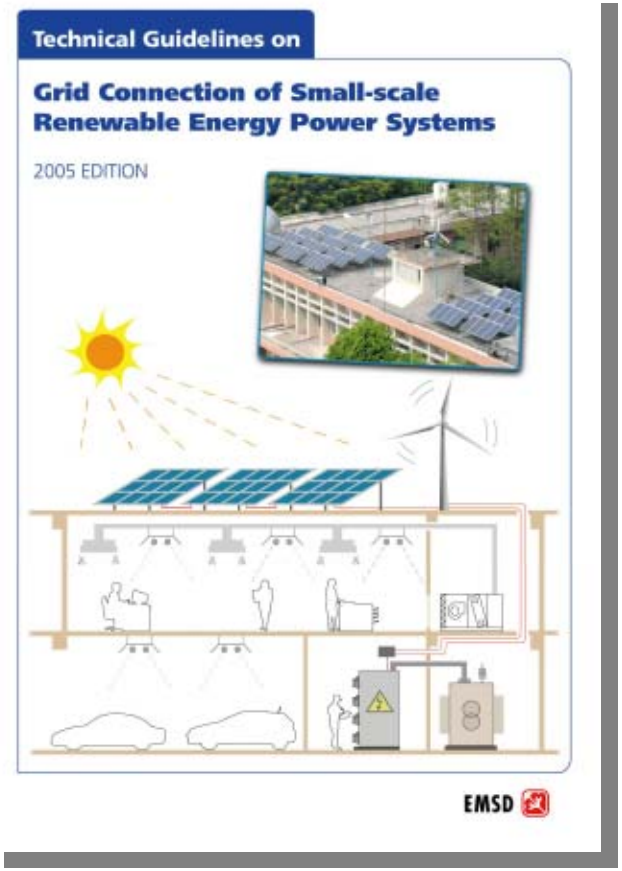
Grid Connection Guidelines

Technical Guidelines on Grid Connection of Small-scale Renewable Energy Power Systems



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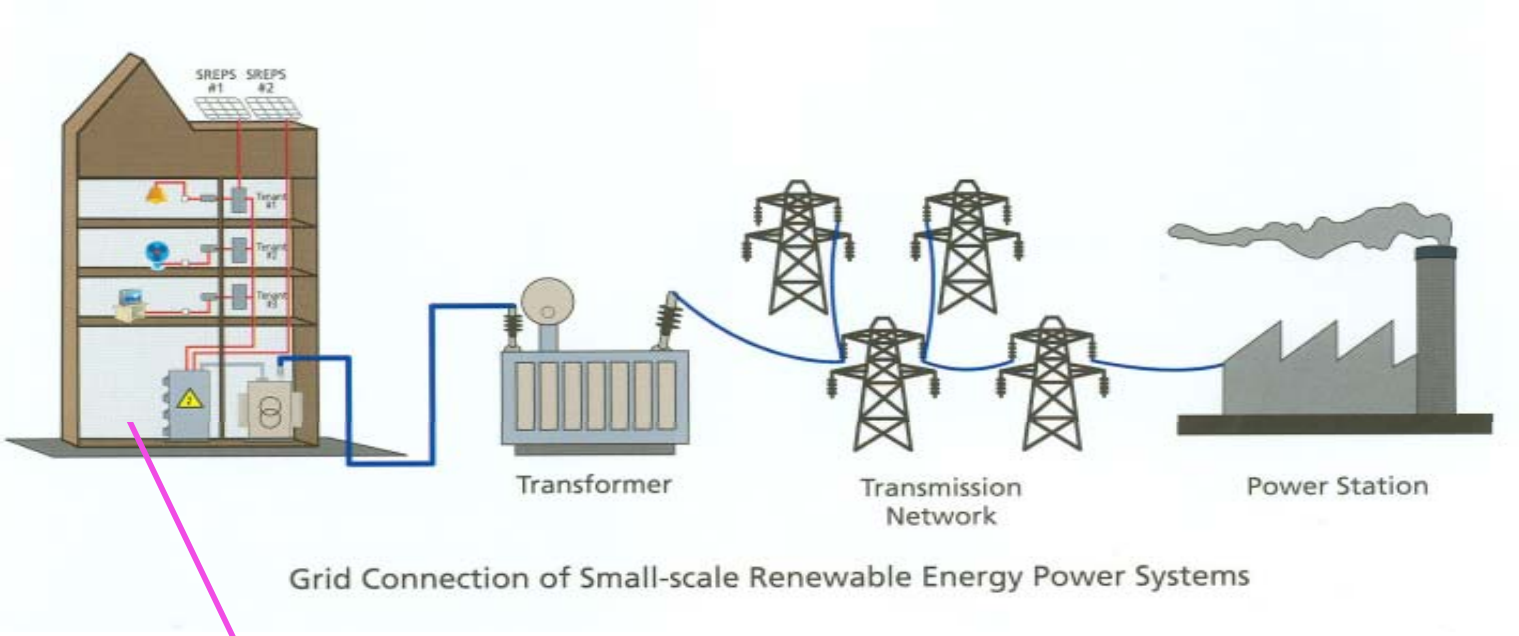
Grid Connection Guidelines



“RE User”

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Grid Connection Guidelines

- Applicable to small grid-connected RE systems with aggregated power rating up to 200 kW per project

- Cover 4 major technical aspects
  - Safety
  - Equipment Protection
  - Reliability
  - Power Quality

Internet Platform on RE Technologies

- An Internet portal to serve as a hub for RE information in HK
- Work in progress for completion by early 2007

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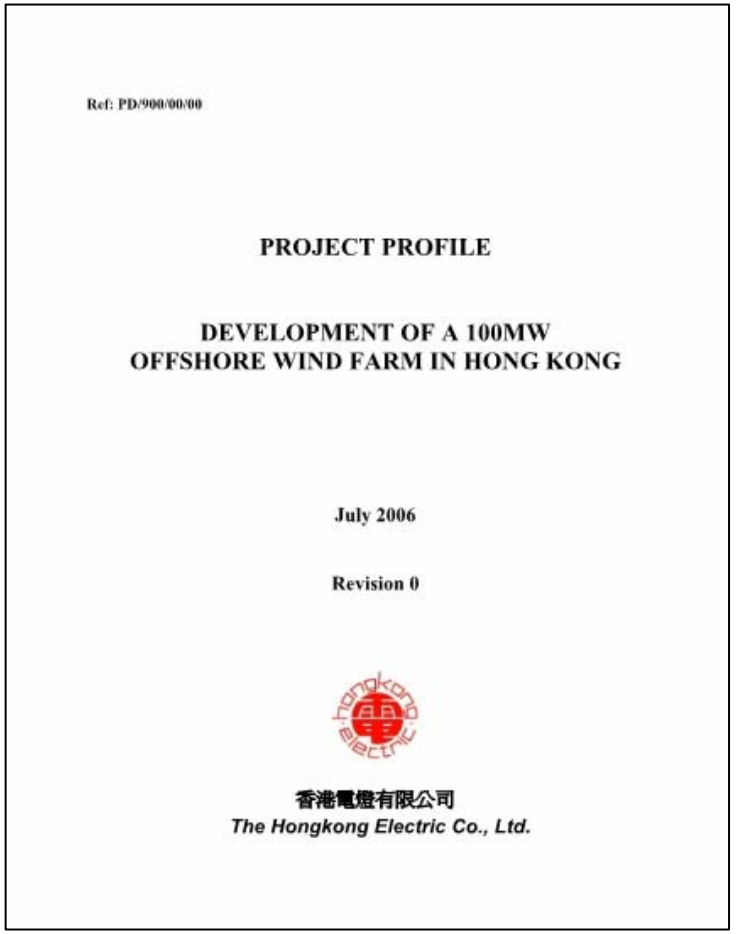
Proposals for Offshore Wind Farms in Hong Kong



Ref: PD/900/00/00

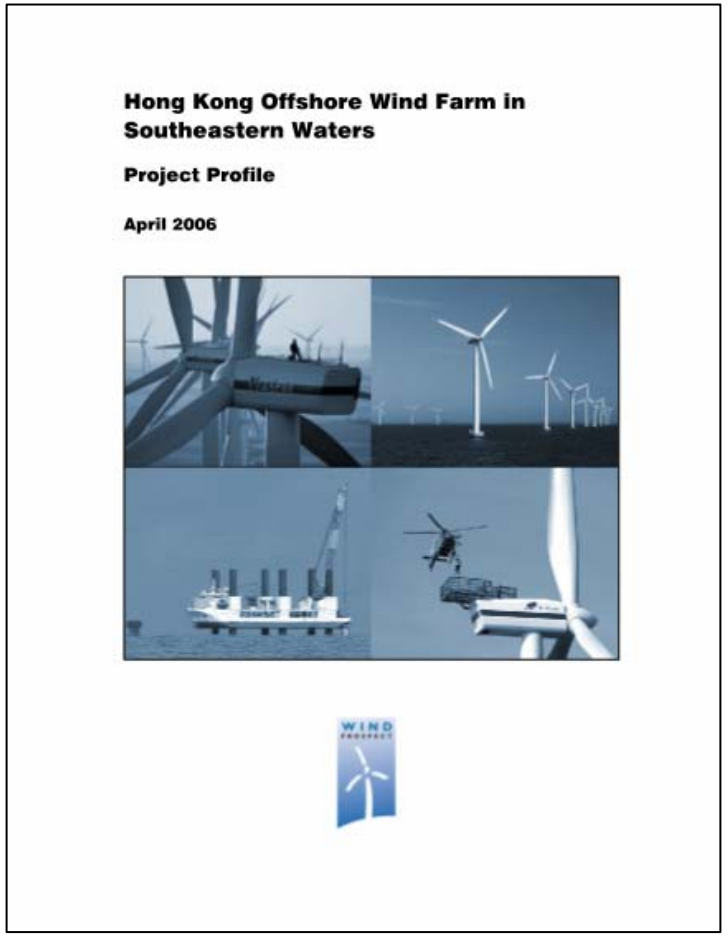
PROJECT PROFILE

DEVELOPMENT OF A 100MW
OFFSHORE WIND FARM IN HONG KONG

July 2006

Revision 0

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



Hong Kong Offshore Wind Farm in Southeastern Waters

Project Profile

April 2006

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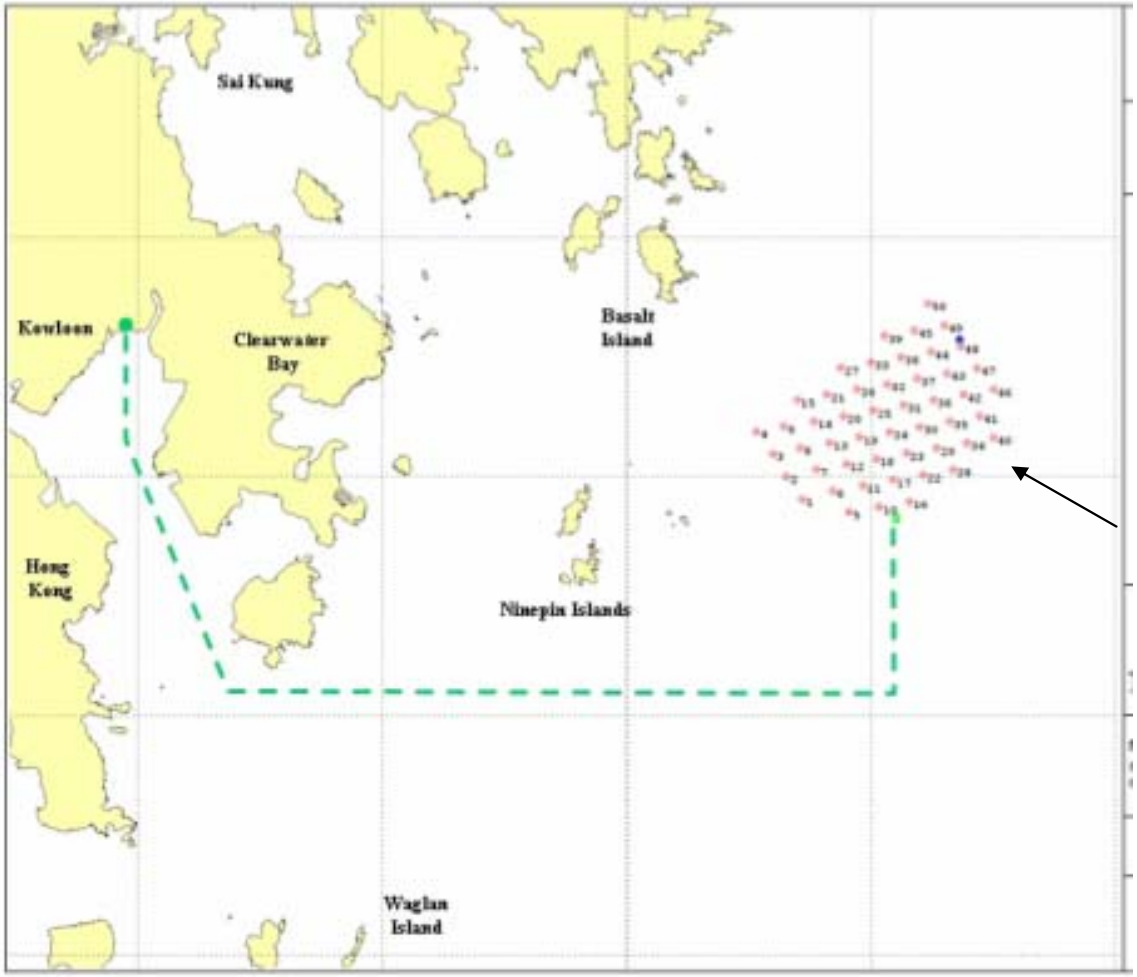

Offshore wind farm proposed by one power company / wind power developer

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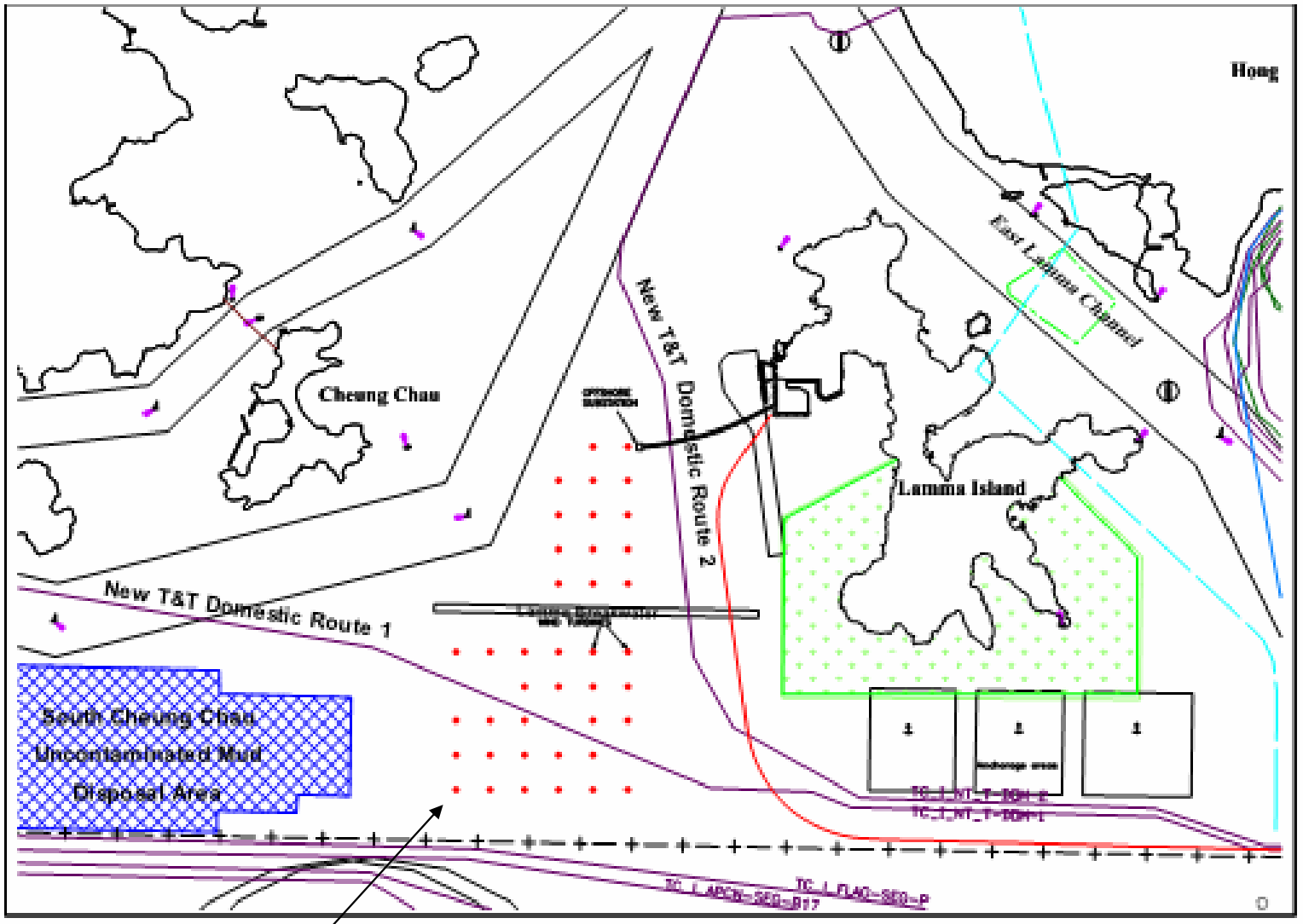
Source: Project Profiles for Proposed Offshore Wind Farms



Another location proposed for the offshore wind farm

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Source: Project Profile for Proposed Offshore Wind Farms

- Preparation is under way by a power company to conduct offshore wind measurement at their proposed site

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Conclusion

- Despite its small geographical area, Hong Kong has made continuing progress in the area of RE
  - Government's efforts in promoting the use of RE, undertaking demonstration projects, public education and conducting studies on RE
  - and also through the efforts of the power utilities, private sector and the academia
- With various sectors of the community working together, it is expected that more RE systems will be installed in various locations in Hong Kong in the near future.

... And the future of RE will be promising!

On 16 October 2006, Google announced plans to install a 1.5 MW PV array on its headquarters in Mountain View, California.

9,000 PV modules like this one will be installed on rooftops and parking lots at the Googleplex.

Source: http://www.renewableenergyaccess.com

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Thank you

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