



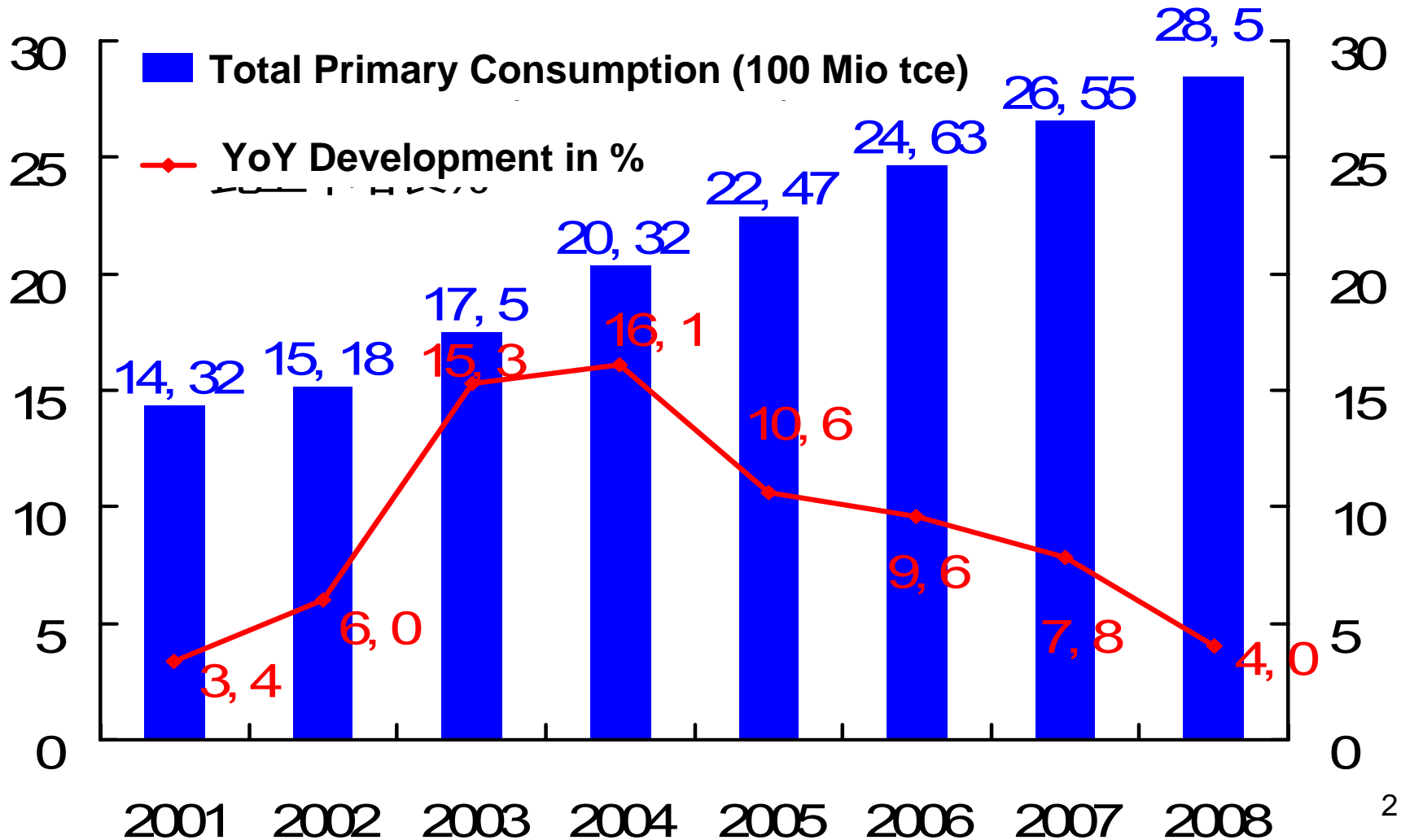
China Renewable Energy Development

PECC Seminar
University of Auckland, NZ

December 8-11, 2009
Denis FOURMEAU
EU Delegation to China

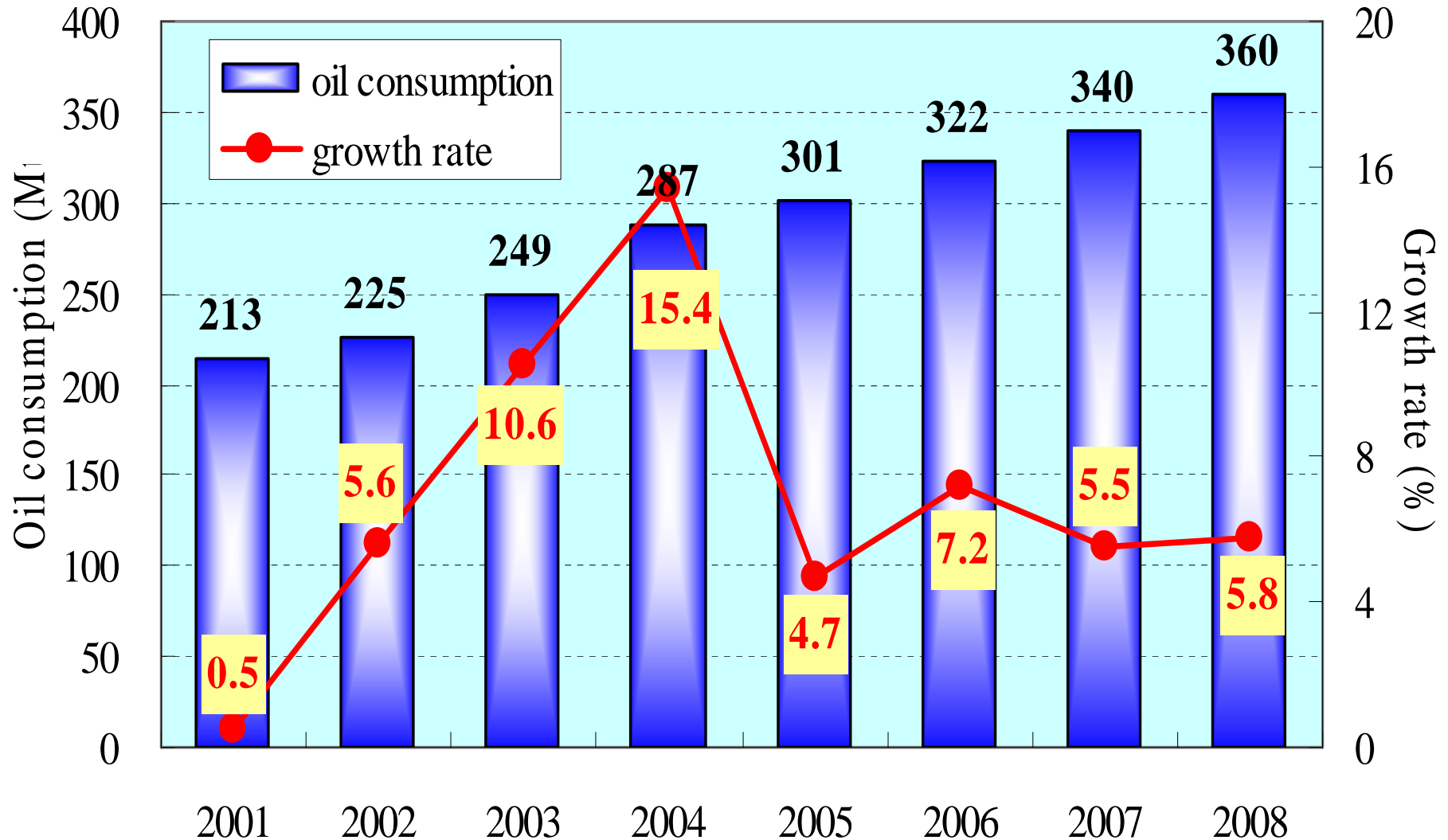


China's Increasing Energy Consumption (2001-2008)





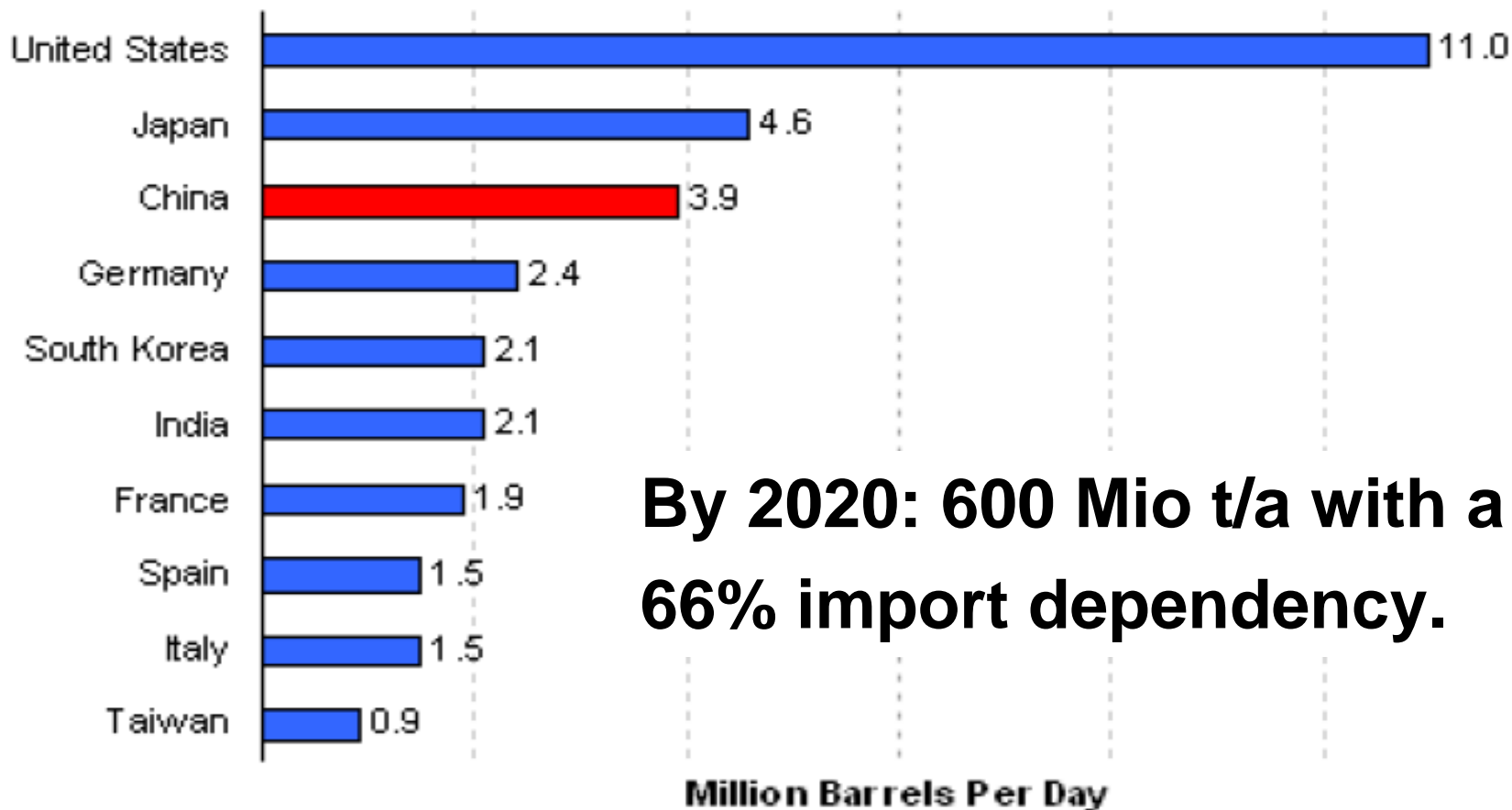
China's Increasing Oil Consumption (2001-2008)





China's Oil Import (2008)

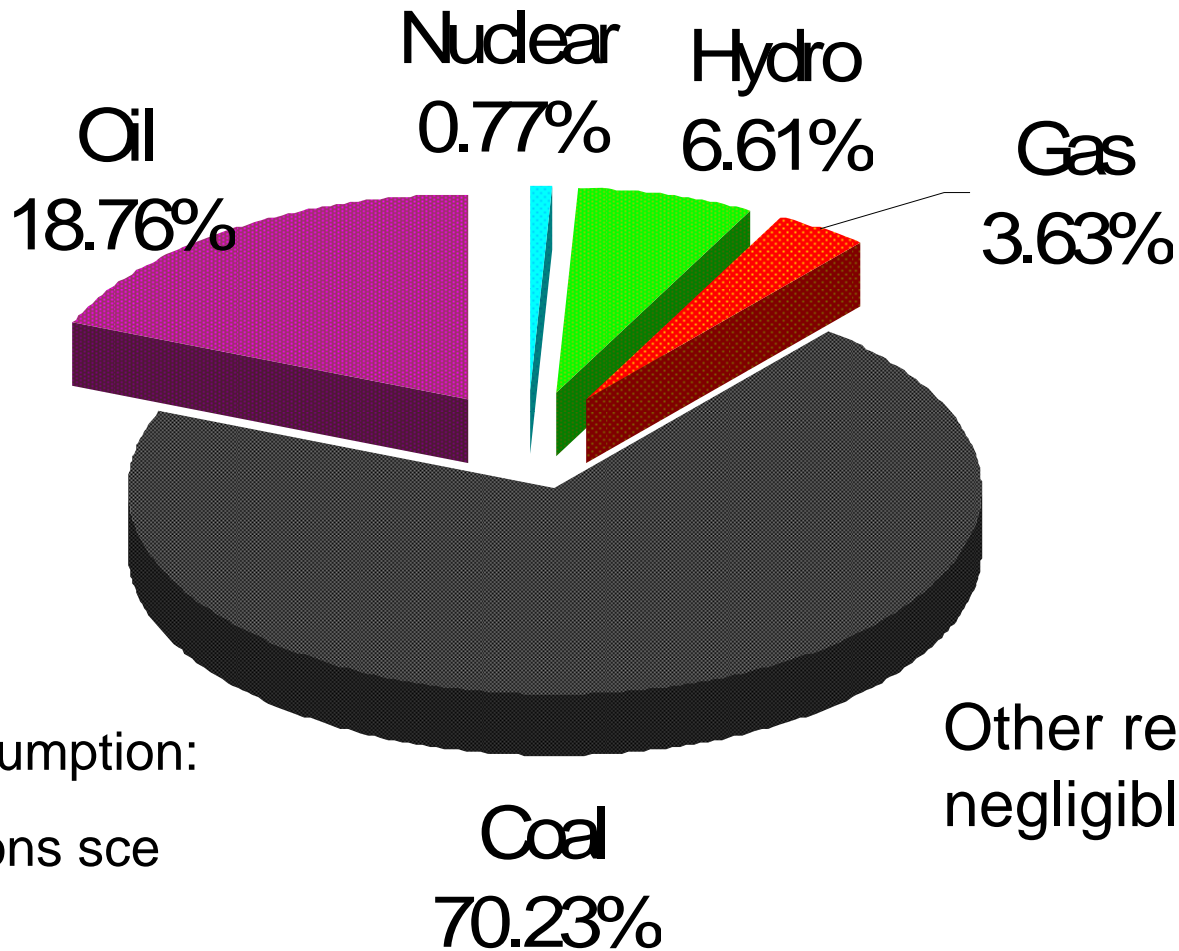
Top Ten Net Oil Importers, 2008*



By 2020: 600 Mio t/a with a 66% import dependency.



China's Energy Consumption Structure by Fuel (2008)



Total consumption:
2.85 Bn. tons sce

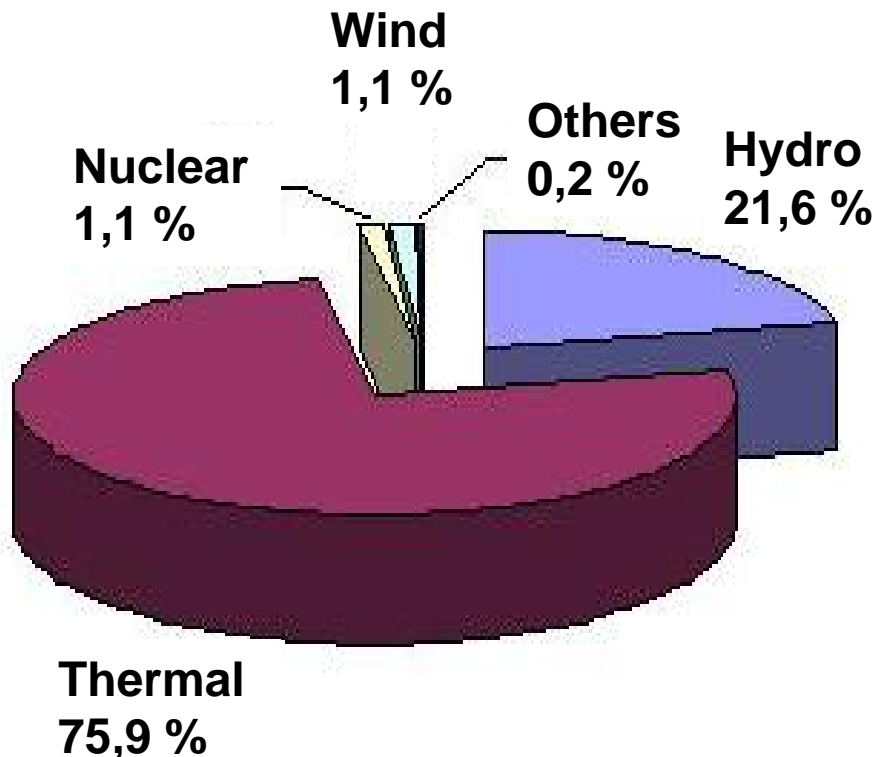
Other renewables:
negligible so far!



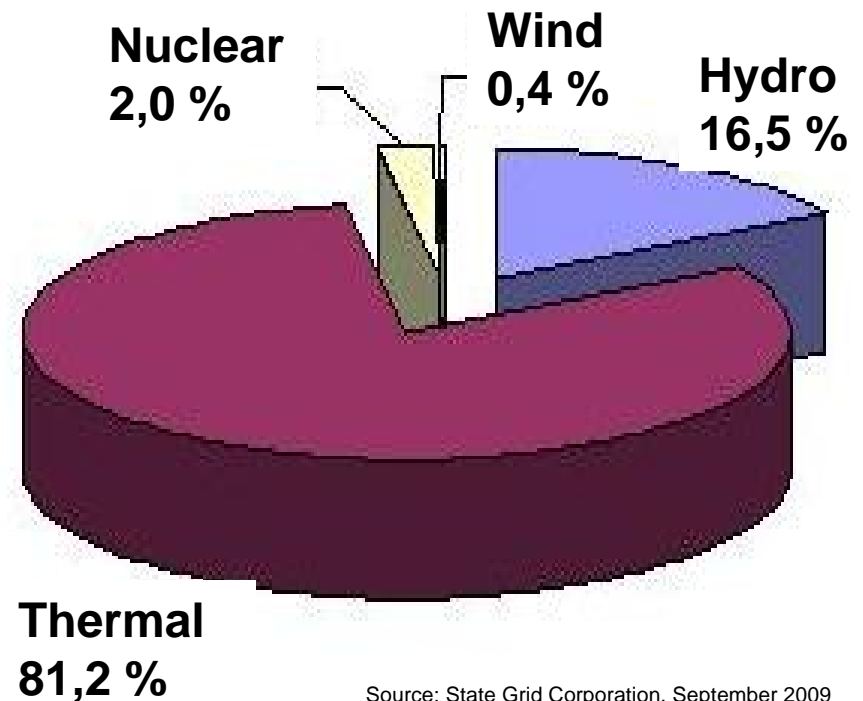
Installed Power Generation Capacity and Structure (2008)

2008: Total installed capacity 793 GW, 10,4% yoy growth
2020: 1500 GW!

INSTALLED

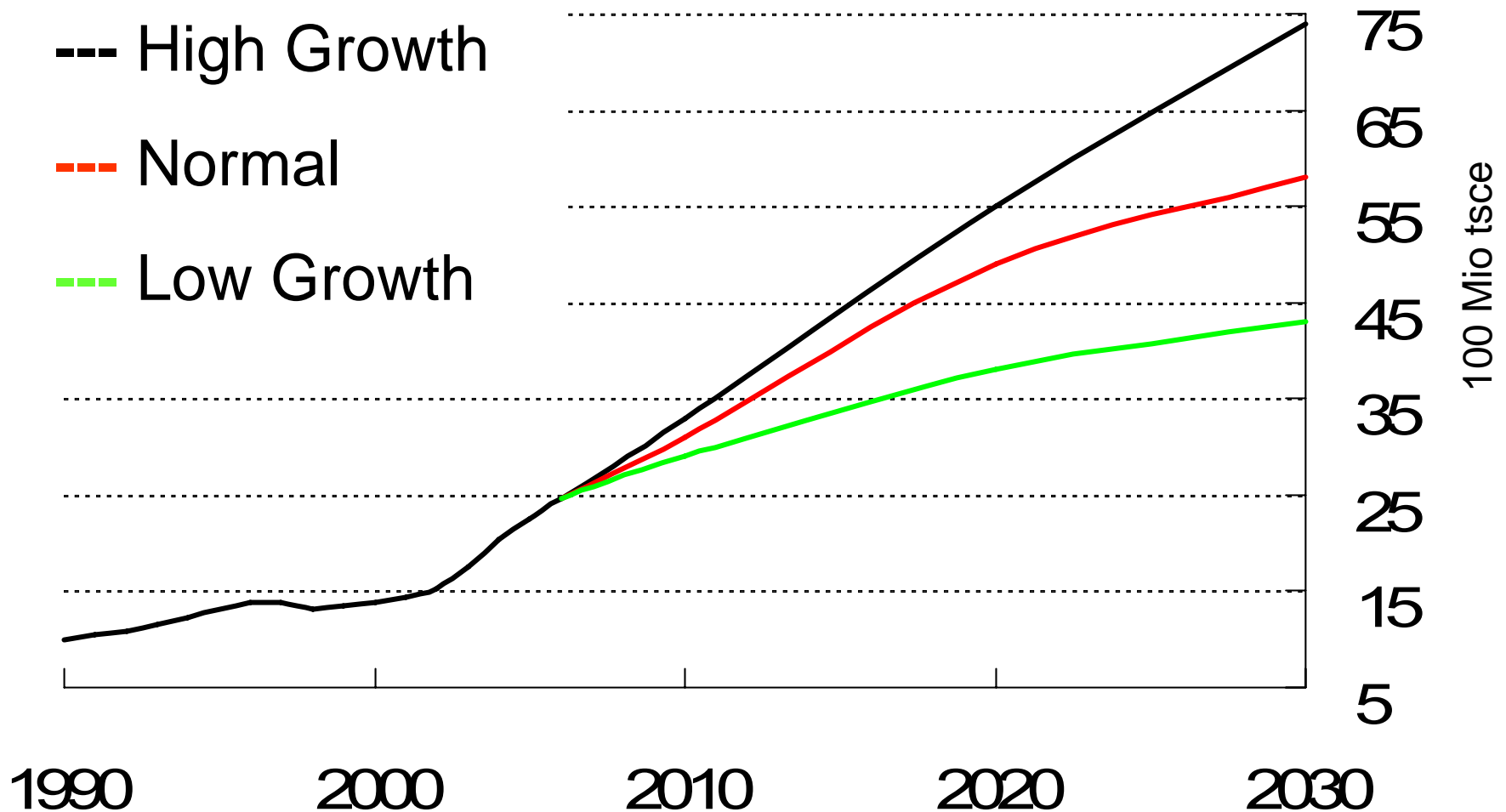


GENERATED



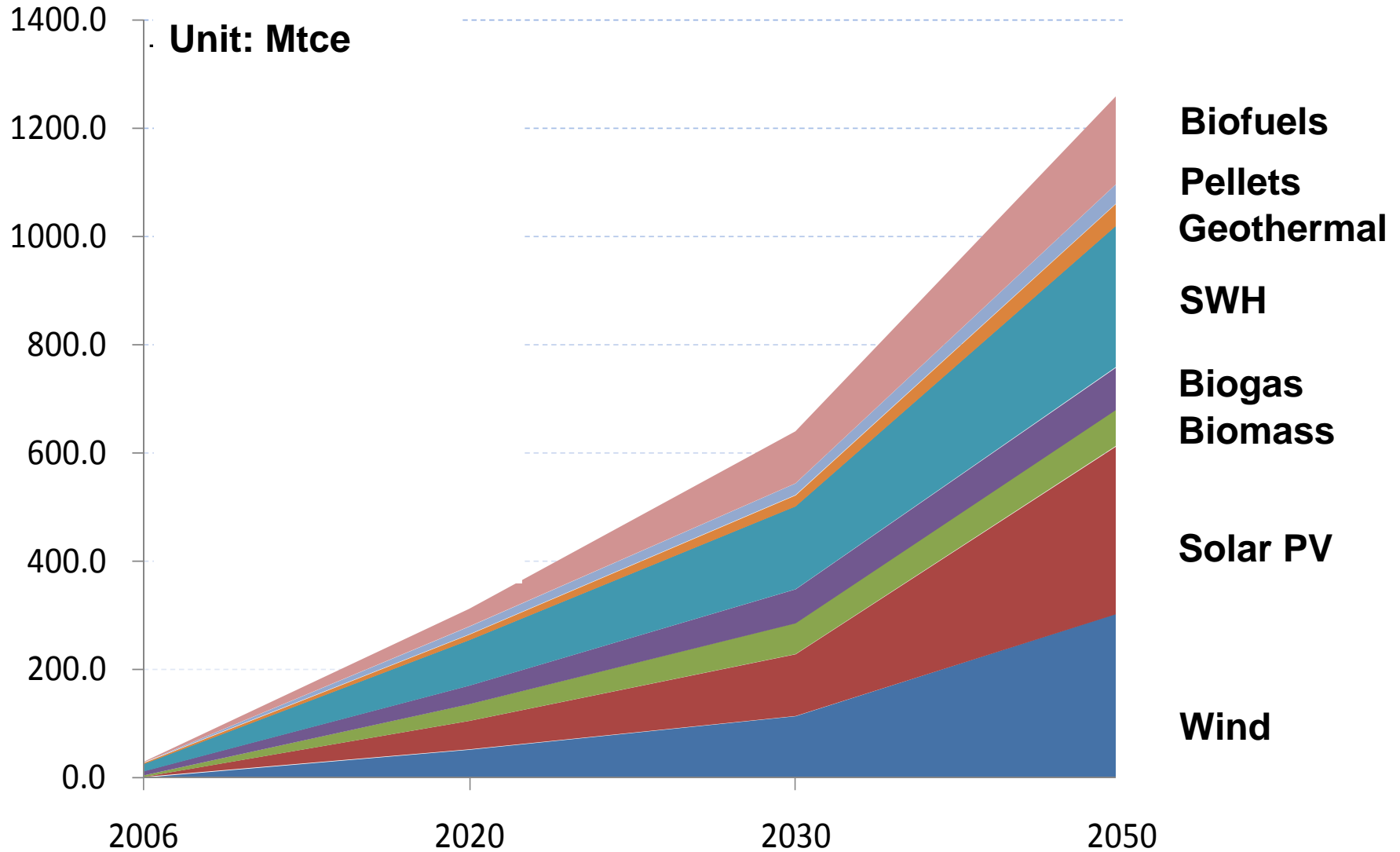


China's Future Energy Demand Growth Trends





China's Renewable Energy Development until 2050





Drivers to Promote Renewable Energy

- Meet Future Energy Demand
- Contribute to Energy Security
- Reduce Energy Import Dependency
- Image of single largest CO₂ Emitter worldwide
- Environmental Protection (e.g. Air, Acid Rain)
- New Growth Area for Industrial Development
 - Job creation
 - Reduce Technological Dependency
 - Meet Domestic/Intl. Market Demands



Political and Legislative Framework Conditions

- 11th Five-Year-Plan 2006-2010
- January 2006 – RE Law came into effect
- September 2007 – Mid and Long-Term RE Development Plan until 2020 released
- Late 2008 – Stimulus Programme announced
- 12th Five-Year-Plan 2011-2015 (under preparation)



Key-Features: Mid and Long-Term RE Dev. Plan 2006-2020

	2005 (Actual)	2010 (Target)	2020 (Target)	2020 (unofficial new Targets)
Hydro	115 GW	180 GW	300 GW	
Wind	1.3 GW	5 GW (35 GW *)	30 GW	100-150 GW
Biomass	2.0 GW	5.5 GW	30 GW	???
Solar PV	0.07 GW	0.3 GW (2 GW*)	1.8 GW	20 GW
SWH	80 Mio m ²	150 Mio m ²	300 Mio m ²	
Ethanol	0.8 Mio t	2 Mio t	10 Mio t	
Biodiesel	50,000 t	0.2 Mio t	2 Mio t	
Pellets	~ 0	1 Mio t	50 Mio t	
Biogas	8 Bn. m ³	19 Bn. m ³	44 Bn. m ³	
COAL	370 GW	600 GW	1040 GW	
NUCLEAR		12 GW	40 GW	80 GW

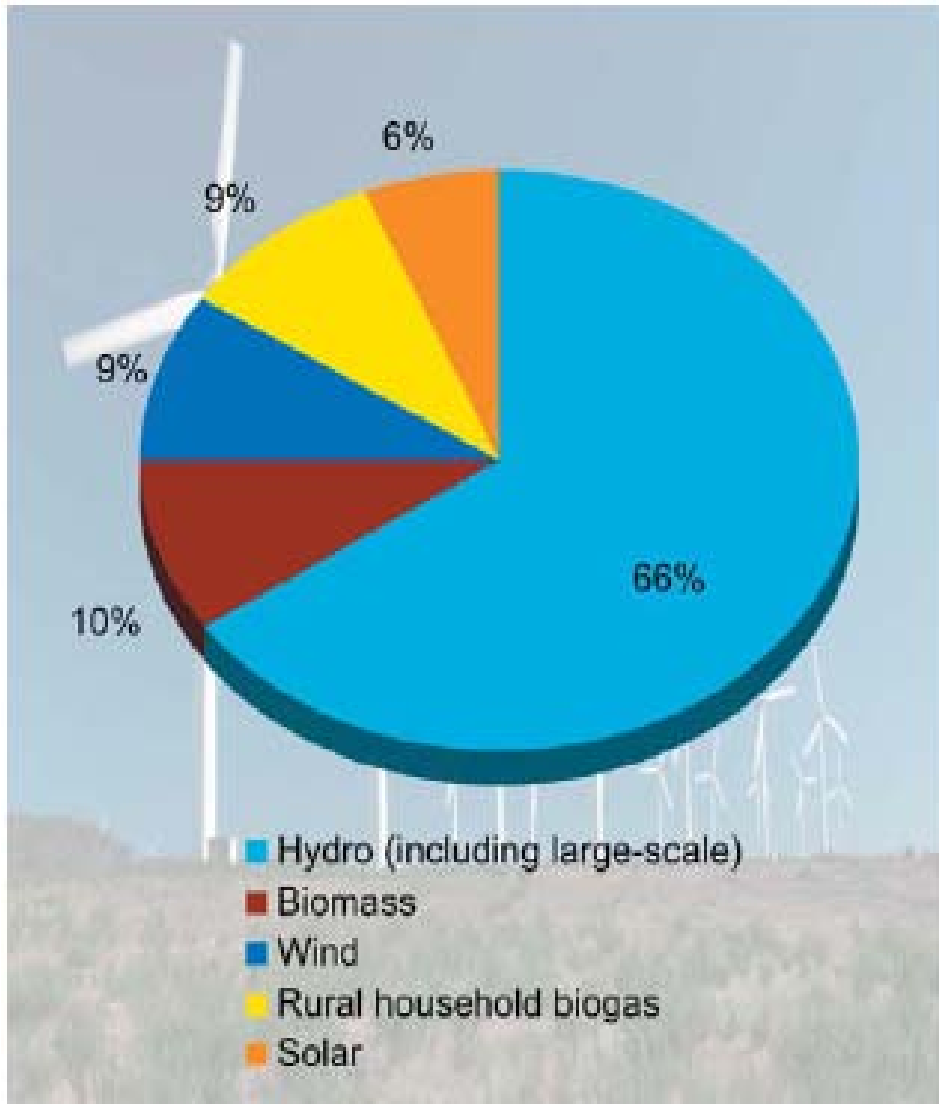


Key-Features: Mid and Long-Term RE Dev. Plan 2006-2020

- Power producers need to have a non-hydro renewable energy % of their total generation capacity of 3% by 2010 and 8% by 2020
- Share of RE in total primary consumption will be 10% by 2010 and 15% by 2020.



Govt. RE Investment Forecast by Sector 2006-2020



September 2007: Release of Mid-to-Long-Term RE Development Plan set out targets and includes an analysis of the investment required if the 2020 targets are to be achieved: \$251 bn. in total, or \$16.7 bn. /a.



China's Stimulus Plan

- China's \$586 bn. stimulus plan is quite 'green', and includes the largest dedicated funding for energy efficiency at \$30.7 bn. The govt. plans to spend \$219 bn. on infrastructure, including upgrades to the grid, estimated at \$36.5 bn.
- NDRC/NEA submitted an "Energy Stimulus Programme" to the State Council late May 2009
 - Estimated Total Investment: € 140 – 430 bn.
 - Released expected end of 2009 but perhaps as a revised Mid- and Long-Term RE Development Plan!

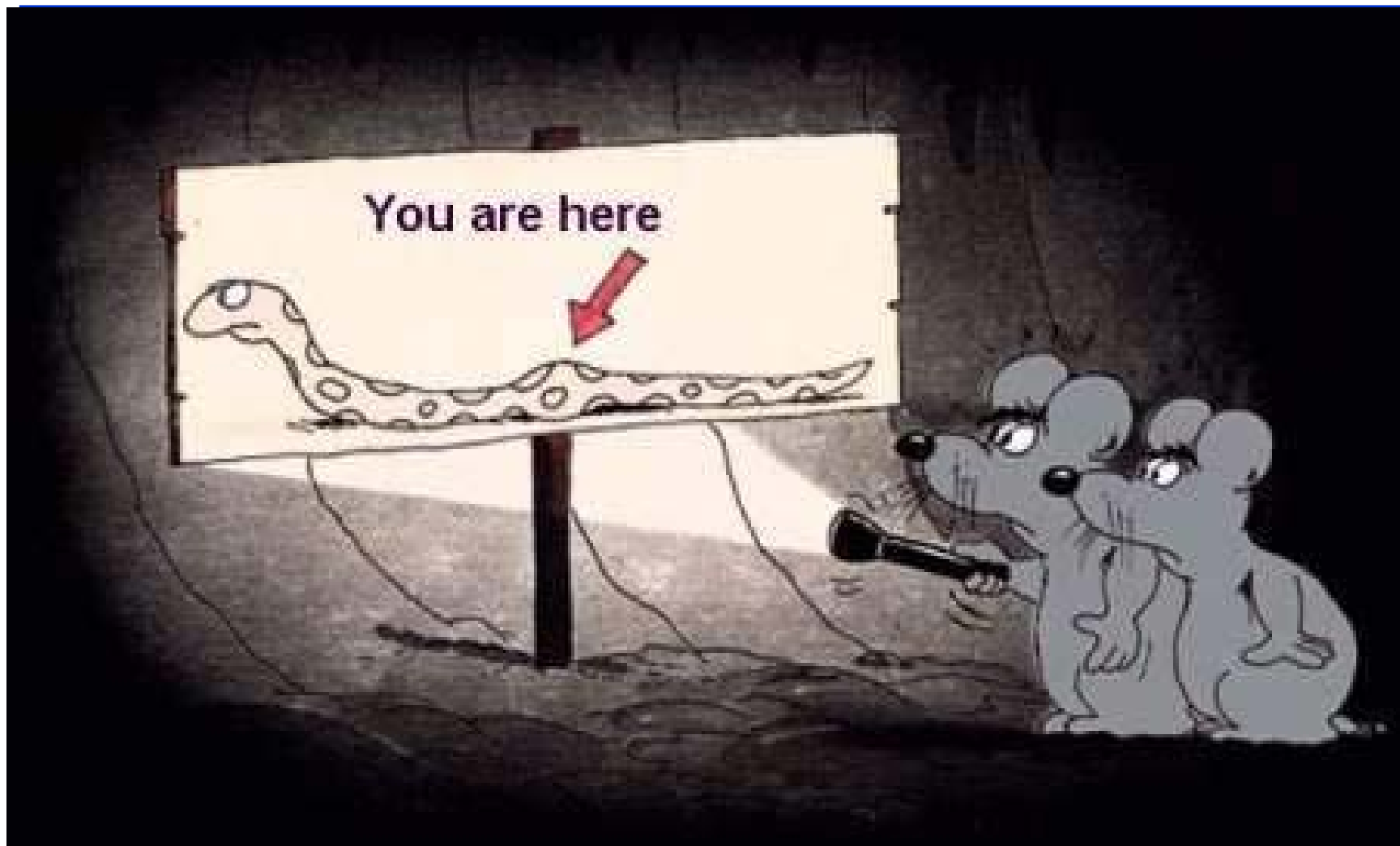


Govt. Investment Commitments until 2014

April 2009, the G-20 nations announced various fiscal stimulus packages to be spent over the next 2 to 5 years. China devoted roughly \$67 bn. including water and energy efficiency.

Figure 51: Break down of Global Stimulus allocation to Sustainable Energy, by Support Mechanism, March 2009, \$ millions

Country or Multilateral	Grant	Grant/ Loan	Loan	Loan Guarantee	ROC	Tax Credit	Tax Credit Bond	Tax Deduction	Other	Grand Total
Australia	2,887							186	303	3,376
Brazil				1,100				818		1,918
Canada	808									808
China	68,724									68,724
EU-27	3,342	7,940								11,282
France	2,157		331							2,488
Germany	1,740								1,985	3,725
India										
Italy										
Japan	1,070	2,900				4,000				7,970
South Korea	7,737									7,737
Spain	953		0						6,617	7,570
UK	441	551			771				962	2,724
US	27,568			17,000		19,739	1,381	0	872	66,560
Grand Total	117,427	11,391	331	18,100	771	23,739	1,381	1,004	10,739	184,883





China's Wind Power Resource Map

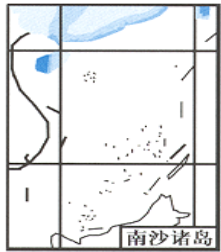
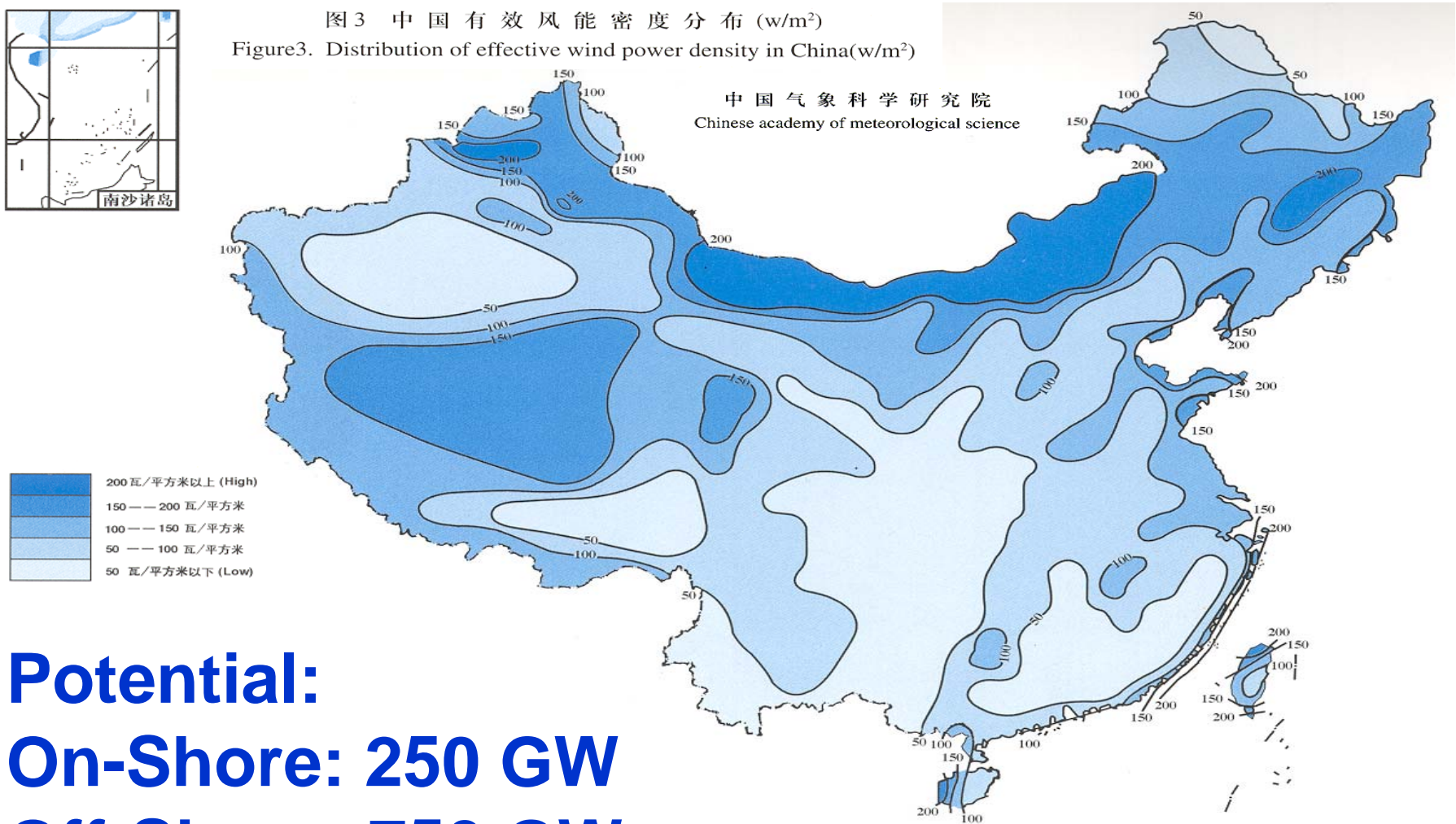


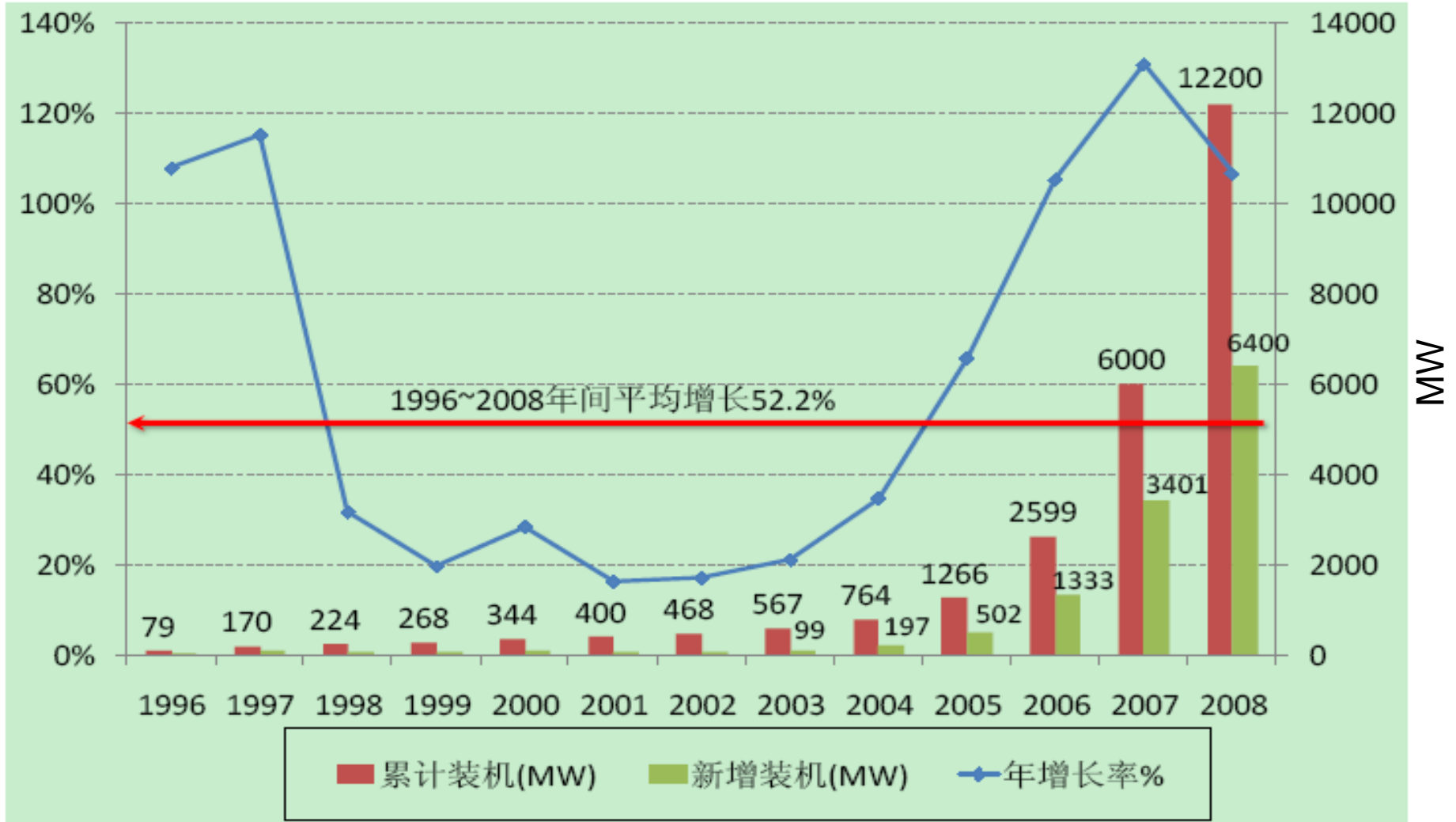
图3 中国有效风能密度分布 (w/m^2)
Figure3. Distribution of effective wind power density in China (w/m^2)



Potential:
On-Shore: 250 GW
Off-Shore: 750 GW



China's Wind Power Development (1996-2008)





China's Wind Power Development (2008)

Top 10 new capacity

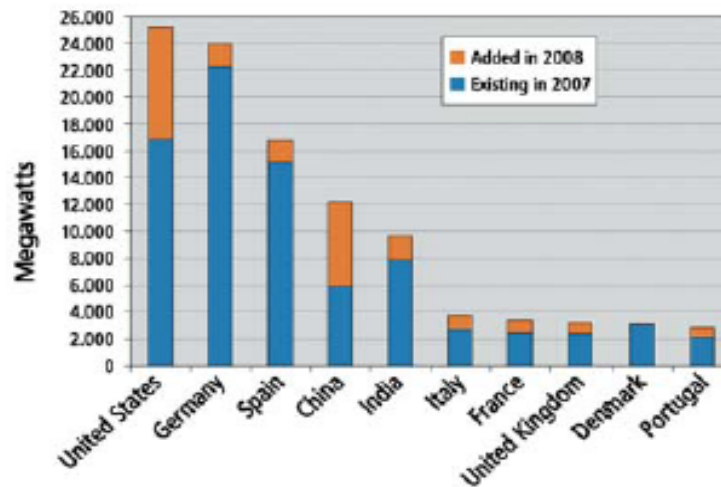
Top 10 total installed capacity

2008: Total installed capacity doubled for the fourth year in a row. New installed capacity totaled 6.3 GW.

	MW	%
US	8,358	31
China	6,300	23
India	1,800	7
Germany	1,665	6
Spain	1,609	6
Italy	1,010	4
France	950	4
UK	836	3
Portugal	712	3
Canada	523	2
Rest of the world	3,293	12
Total top 10	23,763	88
World total	27,056	100

	MW	%
US	25,170	20.8
Germany	23,903	19.8
Spain	16,754	13.9
China	12,210	10.1
India	9,645	8.0
Italy	3,736	3.1
France	3,404	2.8
UK	3,241	2.7
Denmark	3,180	2.6
Portugal	2,862	2.4
Rest of the world	16,686	13.8
Total top 10	104,104	86.2
World total	120,791	100.0

Figure 2.
Wind Power Capacity, Top Ten Countries, 2008





Wind Power Development Threats and opportunities

THREATS:

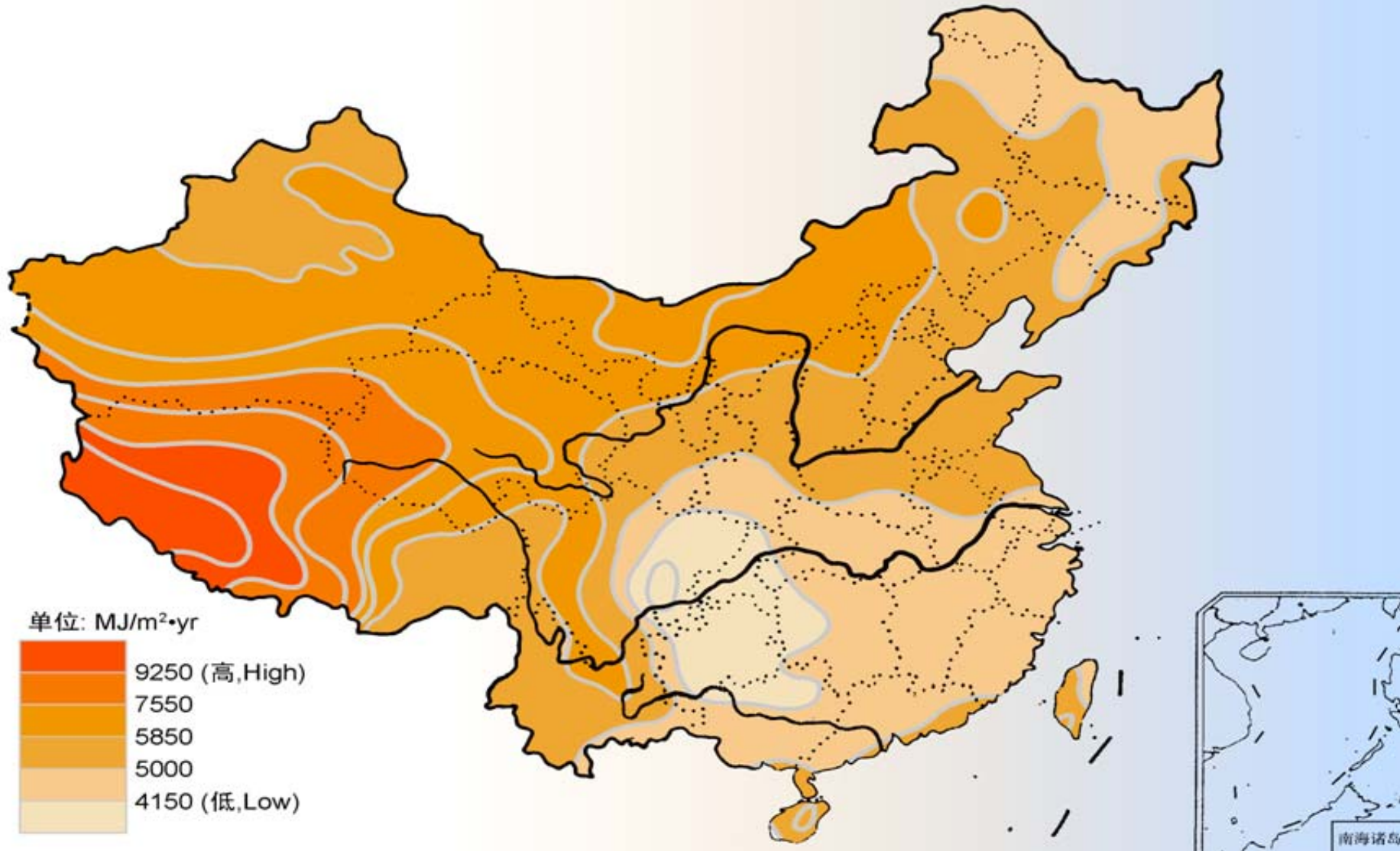
- Over-Capacity of Turbine Manufacturer
 - (production capacity 12 GW by 2009 // est. 17 GW by 2010)
 - ⇒ Govt. encourages shift of production towards 2 MW turbines
- Grid Connection
 - 2008 approx. 30% of turbines not connected
- Human resources
 - Growing demand, and limited offer of currently available skills and expertise

OPPORTUNITIES:

- Feed-in-Tariff announced July 27, 2009
 - 4 tariffs for 4 regions range from RMB 0.51 – 0.61/kWh
- Off-Shore Potential
 - Shanghai, Jiangsu, Northern Shandong are focal areas

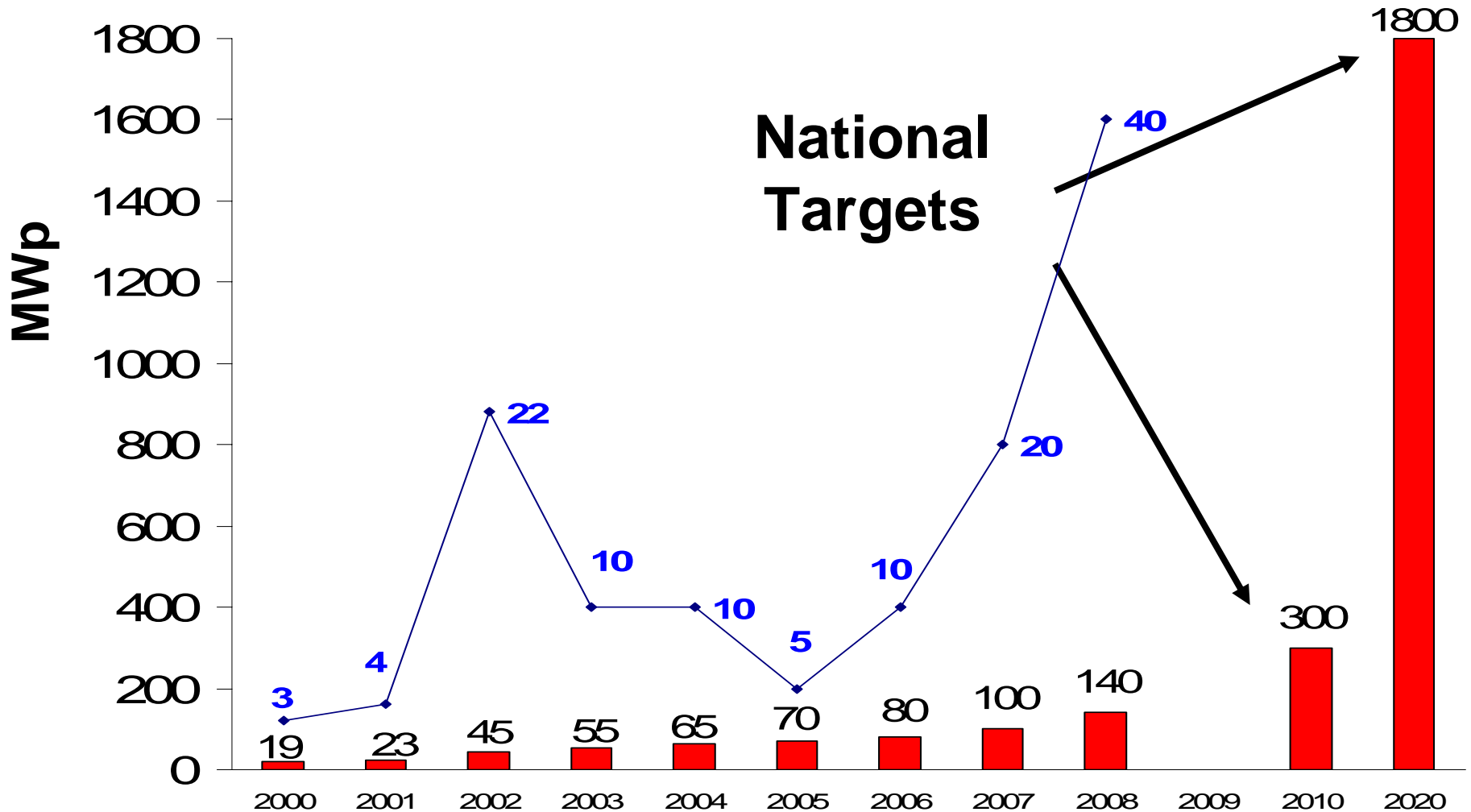


Solar Radiation Map of China





Solar Market Development (2000-2020)





Natl. Energy Administration Feed-in-Tariff (FiT)

国家发展和改革委员会文件

发改价格[2008]1868号

国家发展改革委关于内蒙古鄂尔多斯、上海崇明 太阳能光伏电站上网电价的批复

内蒙古自治区、上海市发展改革委：

报来的《关于内蒙古伊泰集团有限责任公司 205 千瓦太阳能聚光光伏电站上网电价的请示》（内发改价字[2008]422 号）和《关于核定上海崇明前卫村太阳能光伏电站上网电价的请示》（沪发改价公[2007]004 号）均悉。经研究，现批复如下：

一、核定内蒙古鄂尔多斯伊泰集团 205 千瓦太阳能聚光光伏电站和上海崇明前卫村太阳能光伏电站上网电价为每千瓦时 4 元（含税）。

二、以上电价自光伏电站投入商业运营之日起执行，高出当地脱硫燃煤机组标杆上网电价的部分纳入全国分摊。若项目运行成本高于核定的上网电价水平，当地政府可采取适当方式给予补贴，或纳入当地电网销售电价统筹解决。

国家发展改革委

二〇〇八年七月二十一日

主题词：能源 太阳能 电价 批复

August 2008:

Shanghai Chongming Island:
1 MW Inner Mongolia: 205 kW

FiT: € 0.40 / kWh

Duration: unclear

Today: Discussed FiT

RMB 1.09-1.50 / kWh

Final Announcement: Unclear



Ministry of Finance - Solar Subsidy-Programme



关于印发《太阳能光电建筑应用财政补助 资金管理暂行办法》的通知

财建[2009]129号

各省、自治区、直辖市、计划单列市财政厅(局),新疆生产建设兵团财务局:

为贯彻落实《可再生能源法》,落实国务院节能减排战略部署,加快太阳能光电技术在城乡建筑领域的应用,我们制定了《太阳能光电建筑应用财政补助资金管理暂行办法》。现予印发,请遵照执行。

财政部

二〇〇九年三月二十三日

Key Features

- Subsidy RMB 15-20 Wp installed
- Priority BIPV / Roof-top
- Minimum capacity 50 kWp systems
- Eligibility: cell type (mono, poly, thin) must have a minimum efficiency of 16, 14, and 6% respectively
- Cap (Budget / Capacity) unknown
- Submission deadline 1) May 15 2) August 30, 2009

By May 15 submitted applications amounted to approx. 600 MW ! By August 30 ... GW !!!



Ministry of Finance, Ministry of Science and Technology, Natl. Energy Admin.

- Golden Sun Programme (July 21, 2009)
 - Duration 2-3 years
 - Support demonstration projects up to 500-600 MW with 20 MW cap per province
 - Subsidy 50% for on-grid // 70% for off-grid sys.
 - Budget – Cap unknown

Chinese Academy of Science submitted to the State Council a Long-Term Solar Dev. Plan until 2050.

Proposed Targets:

2010 (3.5 GW) 2020 (50 GW) and by 2050 (500 GW)



China - Solar Snapshot

- Hunan Prov.: 1 GW module cap.; 30.000 t UMG-Si; 10.000 t polysilicon; 200 MW mono-si wafer, 1 GW poly-si wafer by 2012
- Jiangxi Prov.: € 400 Mio invest.: 3 GW module cap.; 3 GW cell cap.; 1 GW wafer cap.
- Zhejiang Prov.: ReneSola will construct a combined 5 MW BIPV
- Jiangsu Prov.: By 2011: Target of 10 GW prod.-cap (module and cells)
- Shandong Prov.: € 130 Mio for Cell and Module Prod.-Cap.
- Jiangsu Prov.: € 60 Mio invest.: 200 MW thin-film cell prod.
- Zhejiang Prov.: € 300 Mio invest.: 1 GW thin-film cell prod.
- Jiangsu Prov.: 1,5 MW Roof-Top project (Suntech)
- Qinghai: € 6 bln. Solar Dev. Plan until 2015
- Hubei Prov.: € 100 Mio invest.: 30 MW plant
- Jiangxi Prov.: Q-Cells & LDK Joint Venture
- Qinghai Prov.: 10 MW plant announced
- Yunnan Prov.: 200 MW Roof-Top Prog.
- Fujian Prov.: 16 MW plant
- Jiangxi Prov.: 30 MW plant



Cell & Module Production Capacity (2005-2009)

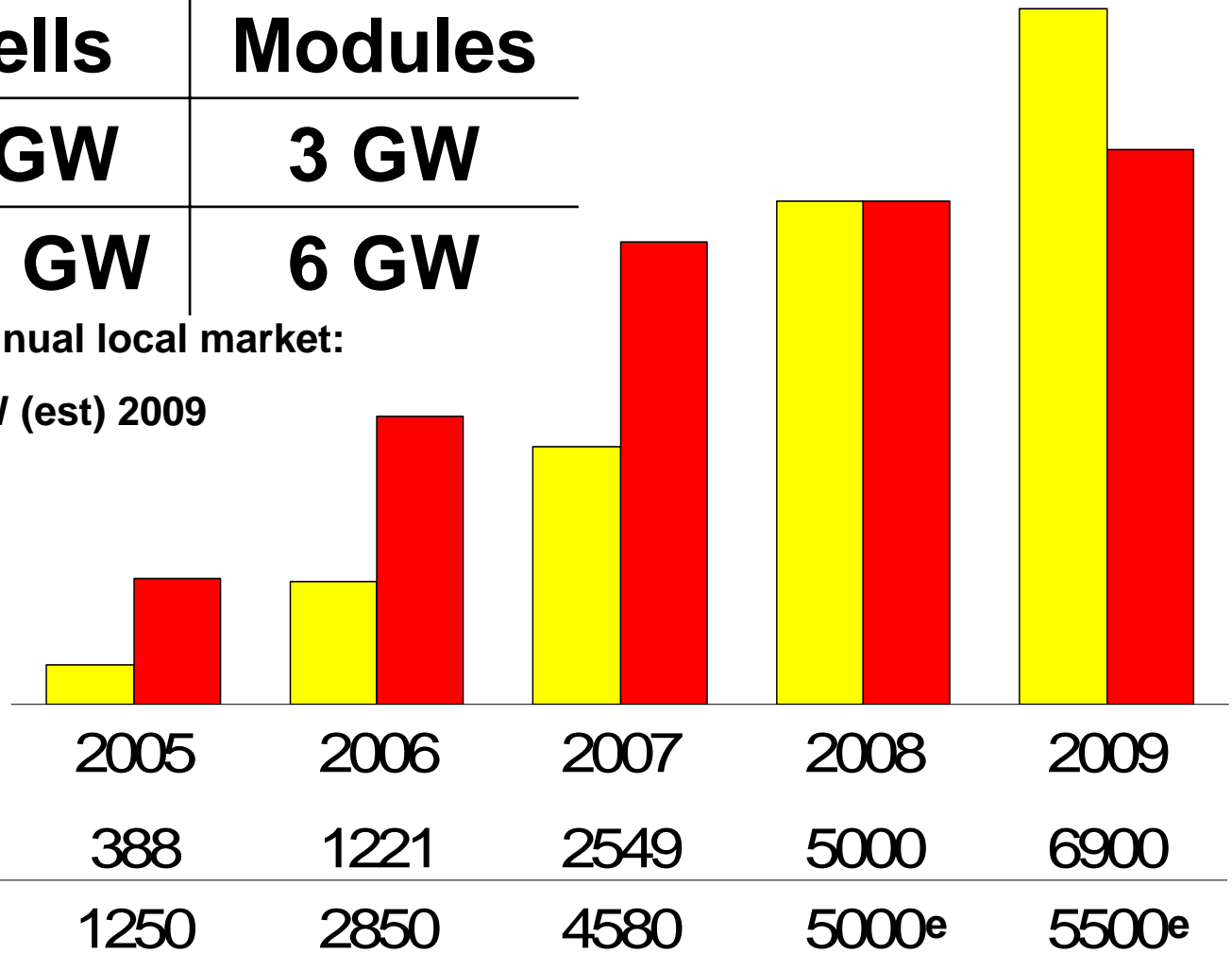
Output	Cells	Modules
2008	2 GW	3 GW
2009 e	4,3 GW	6 GW

To be compared to annual local market:

40 MW in 2008, 70 MW (est) 2009

=> Export > 98% !

Production capacity



SOLAR POWER DEVELOPMENT THREATS

An aerial photograph of a vast solar farm in a desert. The solar panels are arranged in long, parallel rows, creating a grid-like pattern. The surrounding landscape is arid and yellowish-brown, with some green vegetation visible. In the far distance, the pyramids of Giza are visible under a blue sky with scattered white clouds.

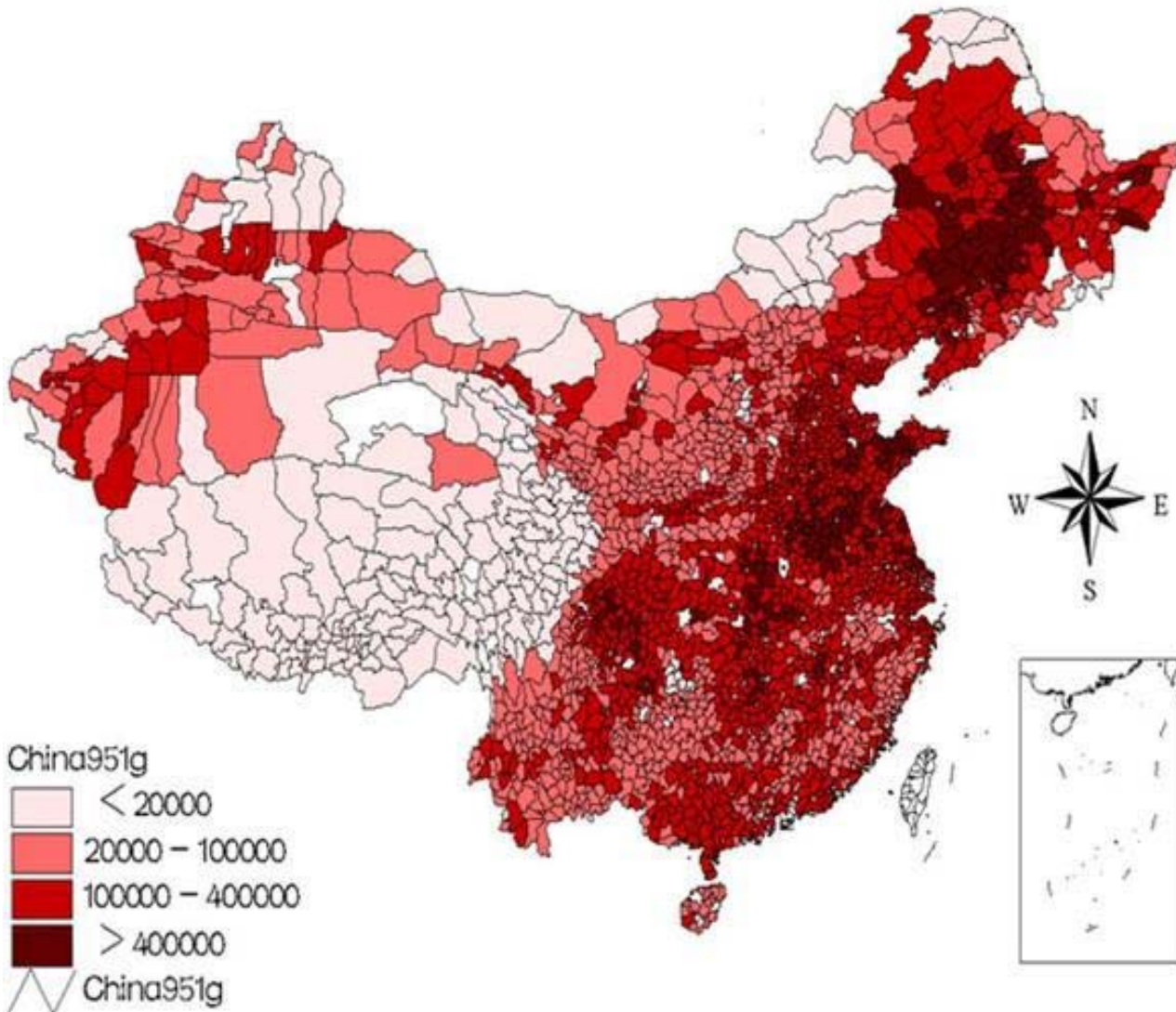
- Over-Capacity
- High Export Dependency
- Little Installation Experience
- Grid connection

OPPORTUNITY:

“Energy from the Desert” program



Provinces for Construction of Biomass Power Plants



Provinces with the highest density of straw per capita are Heilongjiang, Jilin, Liaoning, Hebei, Shanxi, Henan, Xinjiang



Natl. Targets for Biomass Energy Generation Capacity

	2010	2020
Power Generation	5.5 GW	30 GW
Solid Biomass Pellets	1 Mio t	50 Mio t
Biogas	19 Bn. m ³	44 Bn. m ³
No-Crop based Bio-ethanol	2 Mio t	10 Mio t
Biodiesel	0.2 Mio t	2 Mio t



Source: Mid and Long-Term RE Development Plan NDRC



Biomass

Threats and Opportunity

THREATS:

- Rumors to reduce national target
- Sector faces financial difficulties, due to high cost for purchase, collection and storage of feedstock
- Difficulty to ensure sufficient and regular supply of biomass enabling power plants to run at full capacity
- Technical challenges yet to be mastered

OPPORTUNITY:

- Heilongjiang – future hot spot (largest project pipeline, due to streamlined and centralized collection of feedstock – forestry residues - through SOEs)



Summary & Outlook

Political Framework Conditions

- Targets, Programmes & Investments confirms the political commitment to promote the deployment of renewable energies
- Stimulus Package for domestic economy facilitates finance / funding

Industrial Development

- Potential to become the Future Global Centre of Production
- Compliance with intl. quality standards has a high priority
- Good local infrastructure will further enhance cost-competitiveness
- Increasing investment in R&D and training to reduce dependency on foreign know-how

Market Development

- Explosive future domestic market development expected driven by new natl. targets
- Focus on EU / US Markets will remain unchanged
- Opportunities for foreign companies will remain



Conclusion

- China is undertaking one of (if not the) major renewable energy programme in the world
- China is also undertaking one of (if not the) major nuclear energy programme in the world
- These two will be implemented
- **But**, as far as can be seen, coal will remain the main energy source (70% of energy mix)