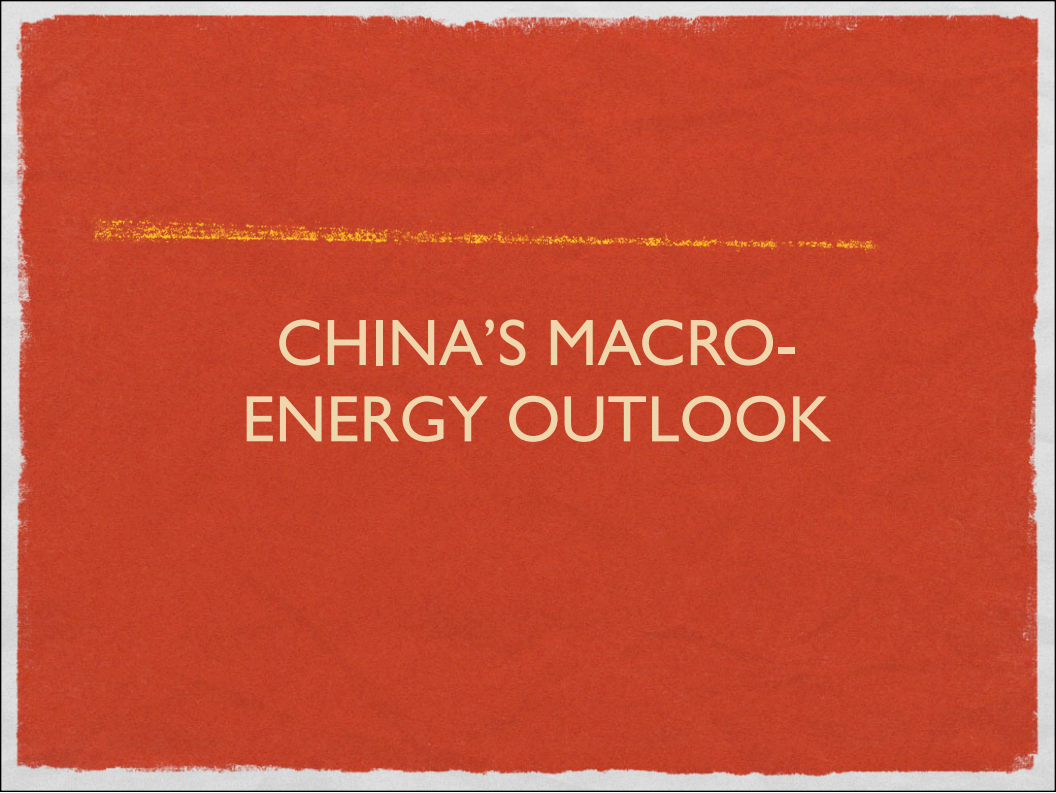


# CHINA'S ENERGY INDUSTRIES 中国能源行业

Louis B. Schwartz, President  
China Strategies, LLC  
[www.chinastrategiesllc.com](http://www.chinastrategiesllc.com)

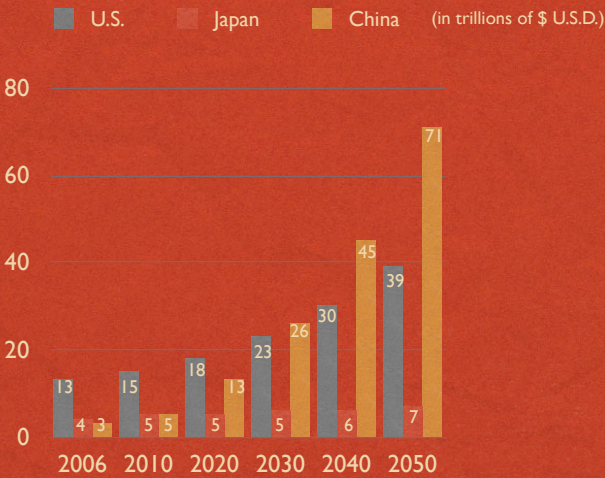
2009 ROTH China Conference  
October 13, 2009  
Fontainebleau Miami Beach

# CHINA'S GDP GROWTH



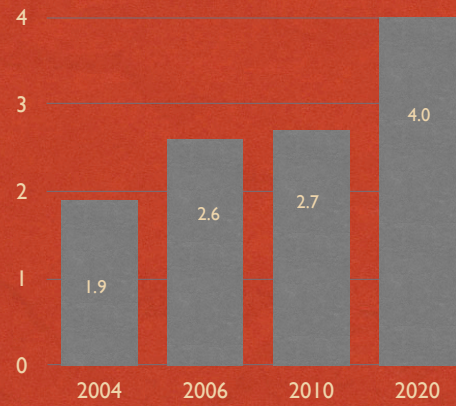
# CHINA'S MACRO- ENERGY OUTLOOK

# GDP PROJECTIONS FOR THE U.S., CHINA & JAPAN (2006-2050)



# GROWTH IN CHINA'S DEMAND FOR ENERGY

■ Total Energy Consumption (in billions of MT of coal equivalents)

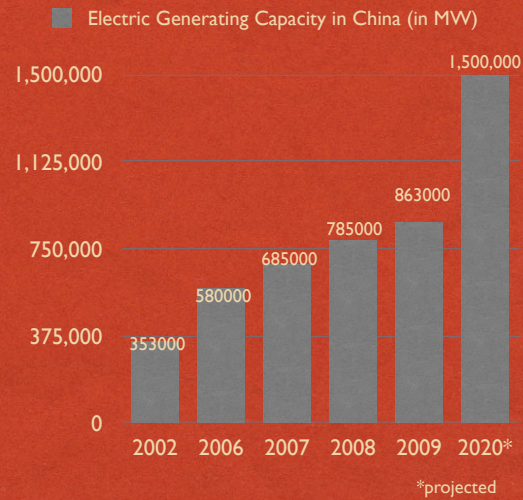


# GROWTH IN OUTPUT OF ELECTRICITY IN CHINA

In 2006 power generated from coal accounted for 69% of total energy consumption in China; by 2050 coal fired power plants will account for 30% to 50% of China's energy needs.

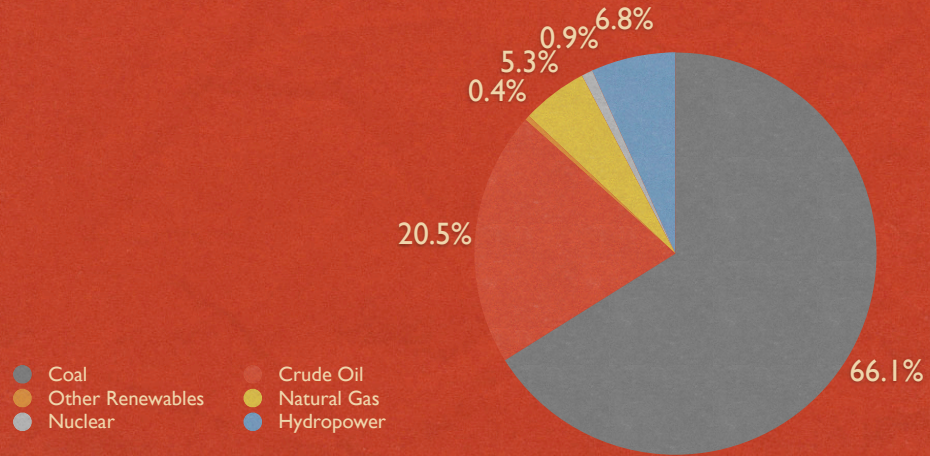
In 2006 alone China added an additional 92,000 MW of coal-fired power plants.

In 2007 11,000 MW of the worst coal-fired power plants were closed. In 2008 another 13,000 MW of outdated capacity will be closed.

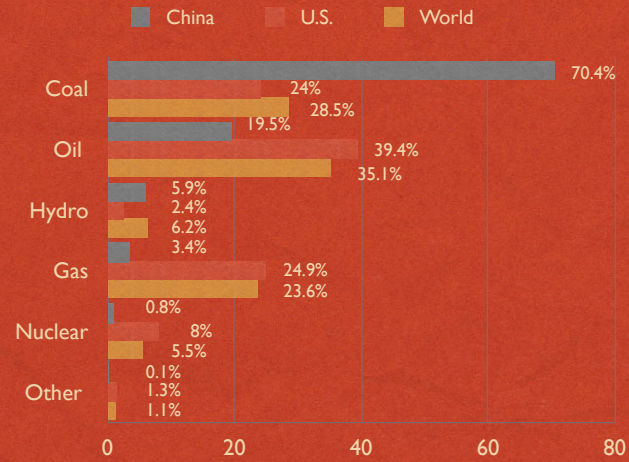


# COMPOSITION OF ENERGY IN CHINA IN 2010

Projected Sources of Energy in China (%) in 2010



# CHINA'S PRIMARY ENERGY MIX COMPARED TO THE U.S. AND THE WORLD TOTAL (% AS OF 2007)



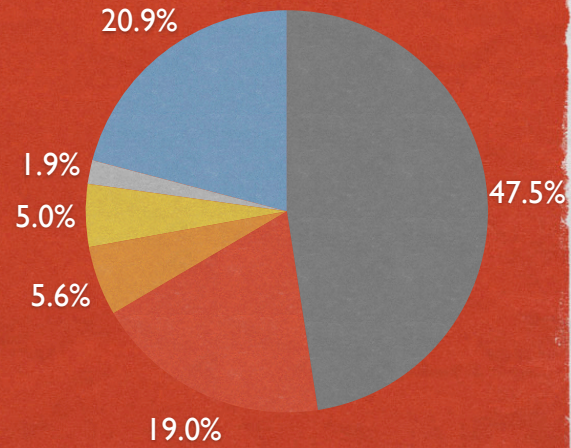


# COMPOSITION OF ENERGY IN CHINA IN 2050

Projected Sources of China's Energy as of 2050 (% of total)

In 2006 coal accounted for ~69% of  
China's total energy consumption

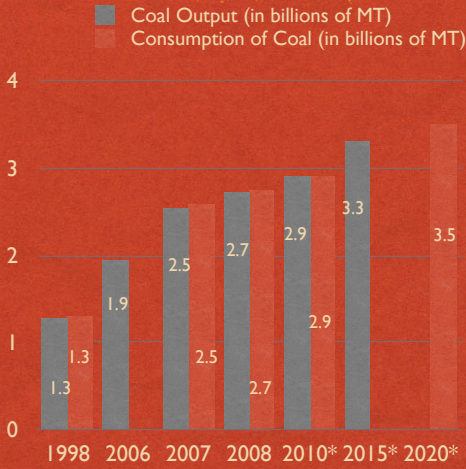
Coal  
Other Renewables  
Nuclear Power  
Crude Oil  
Natural Gas  
Hydropower



# GROWTH BY ENERGY SECTOR

# COAL'S PLACE IN THE CHINESE ENERGY MIX

As a percentage of the world's output of coal, China's coal production has grown from 27.4% in 1998 to 38.8% in 2007.



\*projected

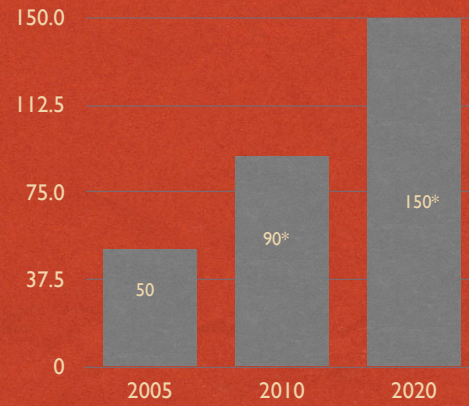
# COAL'S PLACE IN THE CHINESE ENERGY MIX

As the role of coal shrinks, there will be opportunities:

- 1) decommissioning older power plants (~13,000-15,000 MW/year);
- 2) upgrading coal-fired power plants and coal mining through:
  - a) advanced coal mining equipment;
  - b) coal screening and scrubbing;
  - c) integrated gasification combined cycle;
  - d) underground coal gasification combined cycle;
  - e) carbon capture and sequestration;
  - f) flue gas desulfurization;
  - g) flue gas denitration;
  - h) particulate matter removal.

# GROWTH IN OUTPUT OF NATURAL GAS IN CHINA

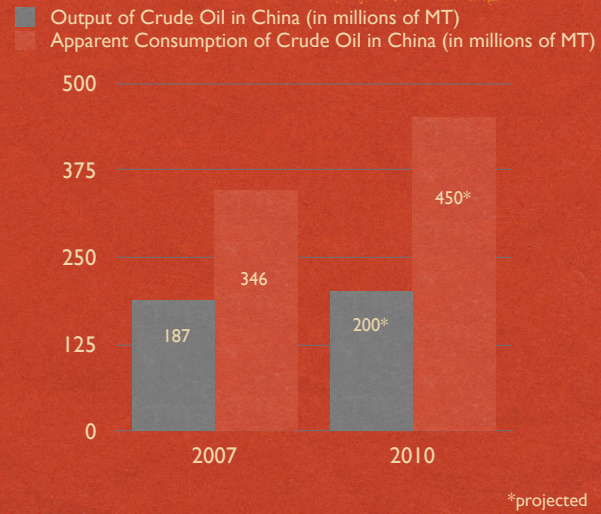
■ Growth in Output of Natural Gas in China (in billions of cubic meters)



\*projected

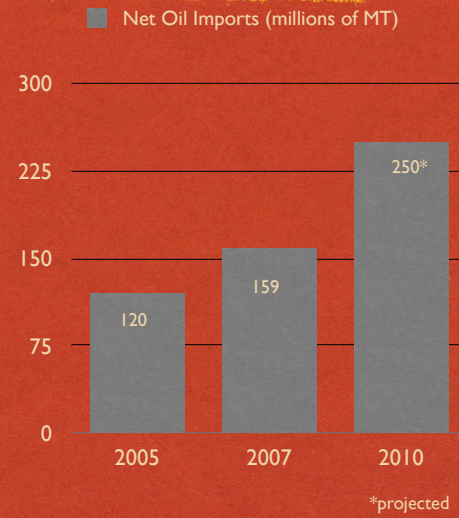
# OUTPUT AND CONSUMPTION OF CRUDE OIL IN CHINA

China's output of crude oil will plateau at ~200 million MT/year beginning in 2010; that level of production is expected to continue for 15 years

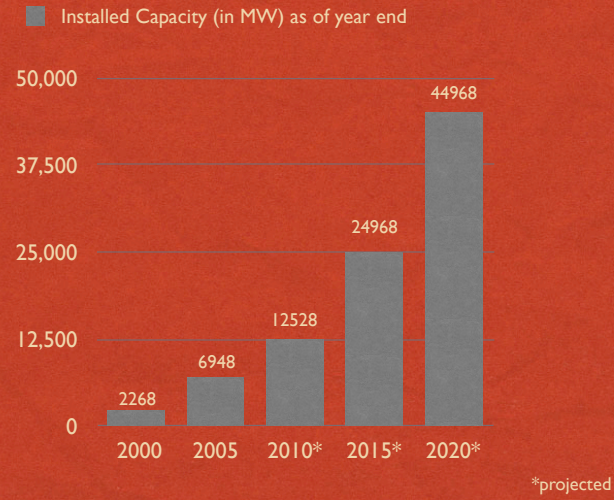


# GROWTH IN IMPORTS OF CRUDE OIL INTO CHINA

China relies on imported oil for ~44% of its oil needs at present; by 2020 China's reliance on foreign sources of oil will rise to ~60%.



# GROWTH OF CHINA'S NUCLEAR ENERGY CAPACITY

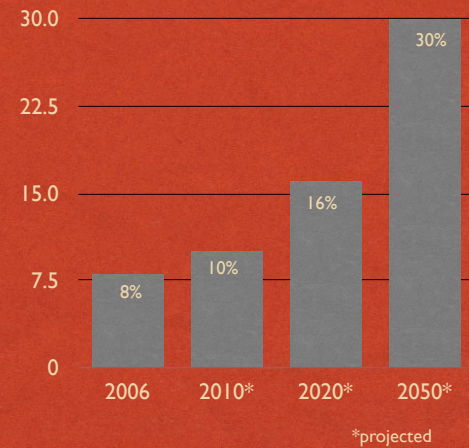




# GROWTH OF CHINA'S RENEWABLE ENERGY CAPACITY

■ Growth in Renewables as a Percentage of Total Energy Requirements

By 2020 there will be 300,000 MW of hydropower, 100,000 MW of wind power, 30,000 MW of biomass, 1800 MW of solar power, 300 million sq. meters coverage of solar hot water heaters, 20 million tpy of bio-fuels and 44 billion sq. meters of methane gas.

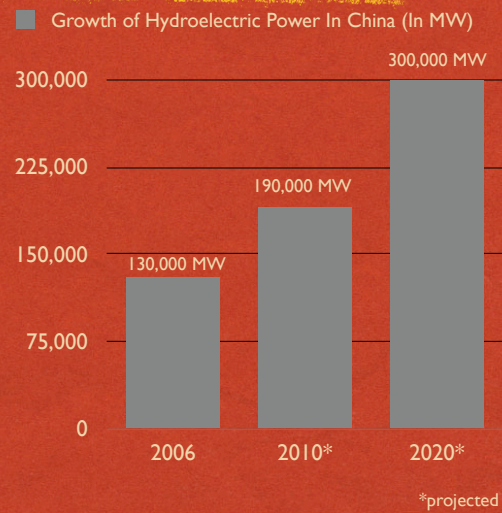


# GROWTH IN CHINA'S HYDROPOWER CAPACITY

According to a 2003 survey of hydropower capacity in China, there is the potential to develop a total of 400,000 MW of economically viable hydropower in China, which would produce 1.75 trillion kwh/year.

In 2010 hydropower will account for nearly 7% of total electric power generated in China and by 2020 more than 20% of total electric power generated in China will be from hydropower.

There are 14 hydropower companies that have their shares listed on the "A" share market.



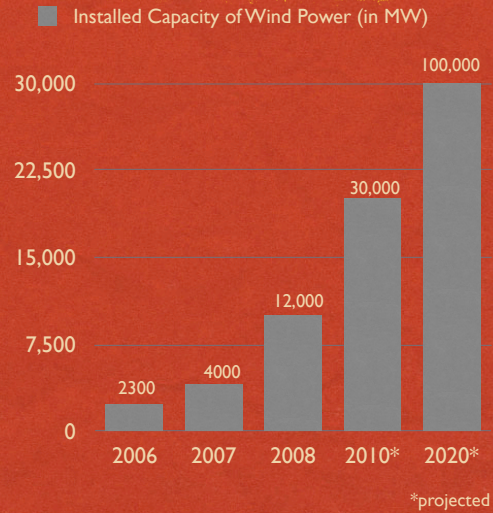
# GROWTH IN CHINA'S WIND POWER CAPACITY

China has an estimated 1 million MW of wind resources, including 250,000 MW of land-based wind resources.

Between 2006-2020 China will spend ~\$28 billion U.S.D. on wind power capacity development

Wind power in China will grow at a rate of 300%/year, second only to the rate of growth in the U.S.

By year end 2008 China's wind power capacity already exceeded 12000 MW, in excess of the 2010 goal set in 2007.



## GROWTH IN CHINA'S SOLAR ENERGY CAPACITY

China is one of the three largest producers of solar cells in the world, yet 90% of what Chinese solar cell manufacturers produce is exported and China may only have 1800 MW of solar power installed by 2020.

# GROWTH IN CHINA'S SOLAR THERMAL INDUSTRY

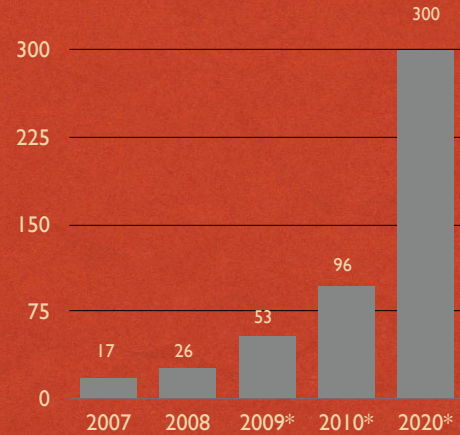
■ Installation of Solar Hot Water Heaters (millions of square meters)

Sales of solar hot water heaters are 10x that of Europe with systems in ~35 million Chinese households.

In 2007 Shandong Province established a \$300 million fund to subsidize the installation of solar hot water heaters in hotels, schools and other buildings; Rizhao, Shandong has the largest adoption rate of solar hot water heaters: 99%.

Chinese solar hot water heater companies earned ~\$2.6 billion in 2006; by 2010 the market for solar hot water heaters is projected to be \$8.2 billion/year.

Nanjing recently joined Jinan, Yantai, Guangzhou and Wuxi in requiring the installation of solar hot water systems in new construction and renovations of building less than 12 stories tall and under.



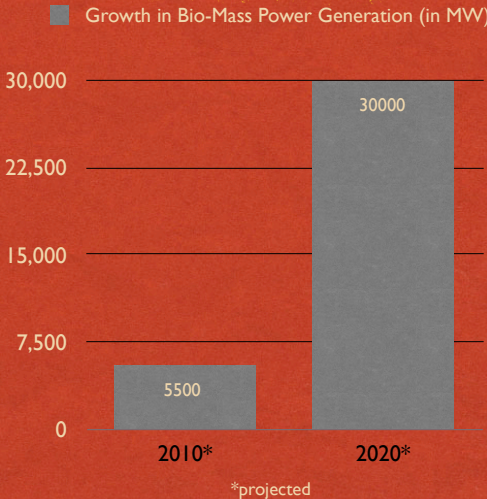
\*projected

# GROWTH IN CHINA'S BIO-MASS ENERGY CAPACITY

Bio-mass power generation is considered an important source of additional income for Chinese farmers.

As of 2007 there were more than 30 bio-mass power generation projects which had been approved

Bio-mass power generation now enjoys a 0.25 Yuan/kwh subsidy.



CHINA'S INVESTMENT IN ITS  
POWER SECTOR  
能源行业投资

## CHINA'S PROJECTED INVESTMENT IN ITS POWER SECTOR

Between 2005 and 2030 China will account for  
23% of the world's investment in power, spending  
\$1.2 trillion U.S.



# CHINA'S INVESTMENT IN ITS POWER SECTOR (2006-2009)

■ Government Spending on Power Generation (in billions of \$U.S.D.)  
■ Government Spending on Grid Capacity (in billions of \$U.S.D.)



## INVESTMENT IN CHINA'S RENEWABLE ENERGY INDUSTRY BY BEIJING

Beijing plans to invest at least ~\$263 billion U.S.D. through 2020 to foster the development of sources of renewable energy

According to the {11th Five Year Plan for Environmental Protection}, which was issued by the State Administration for Environmental Protection, China will spend 1.35% of its GDP to invest in environmental protection measures.

## INVESTMENT IN CHINA'S RENEWABLE ENERGY INDUSTRY: FOREIGN PARTICIPATION

Beijing estimates that China's renewable energy sector attracted ~\$700 million U.S.D. in foreign investment in 2008 and that by 2010 foreign investment in China's renewable energy industries will grow to \$2 billion U.S.D./year.

## INVESTMENT IN CHINA'S ENERGY INDUSTRY: INVESTMENT BY CHINESE COMPANIES

The China National Petroleum Corporation (CNPC) is expected to invest 10 billion Yuan (~\$1.4 billion U.S.) to develop new energy resources, including coal-bed methane, geothermal power, oil shale and wind power.



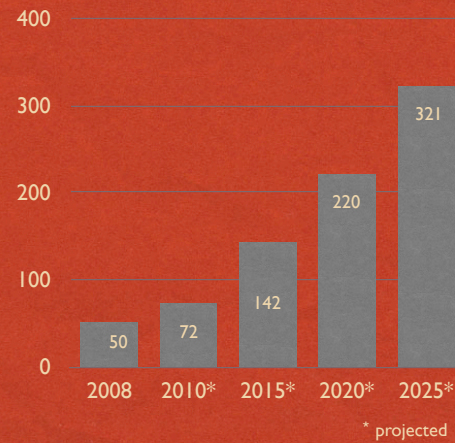
# CHINA'S TRANSPORTATION SECTOR

# PROJECTED GROWTH IN PASSENGER CARS IN CHINA (2008-2030)

Assumes 20% growth from 2008-2010; 15% growth from 2010-2015; 10% growth from 2015-2020 and 8% growth from 2020-2025

China is on course to produce ~10 million passenger cars in 2009

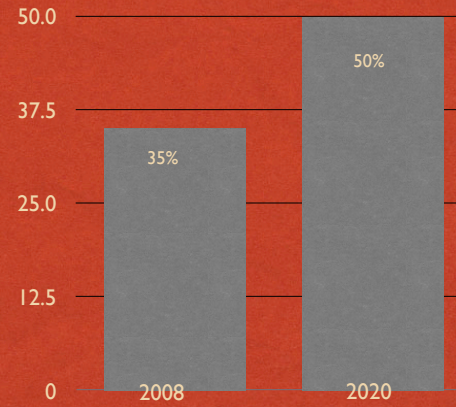
■ Total Number of Passenger Cars Operating in China (in millions of units)



# GROWTH IN CONSUMPTION OF OIL FOR TRANSPORTATION USES

■ Growth in Transportation's Share of Crude Oil Consumption in China (%)

In 2008 China had approximately 50 million passenger cars, representing 4 cars/100 people compared with the U.S. at 80 cars/100 people and Japan with 45 cars/100 people.



# GROWTH IN CONSUMPTION OF ETHANOL FOR TRANSPORTATION USES

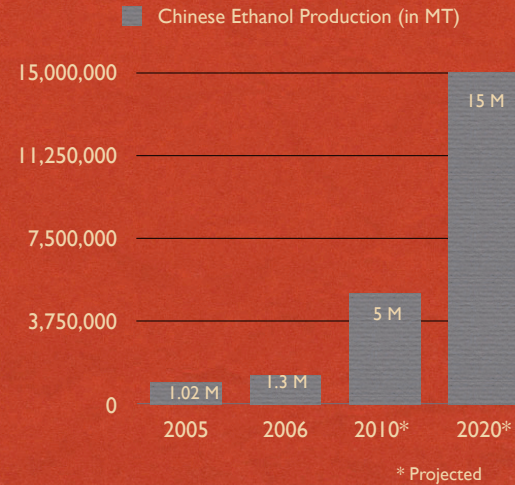
In 2010 fuel ethanol will account for more than 80% of all bio-fuel output.

In 2006 ~4.75 million MT of corn were used to produce ~1.3 million MT of fuel ethanol.

In 2006 Beijing placed a moratorium on the creation of new grain ethanol businesses.

Beijing has provided a subsidy for ethanol production. To discourage the further development of the grain ethanol industry the subsidy has declined from 1883 Yuan/MT in 2005 to 1373 Yuan/MT in 2008; after 2008 the subsidy will be eliminated.

Non-grain fuel ethanol production is expected to reach 2 million tpy by 2010



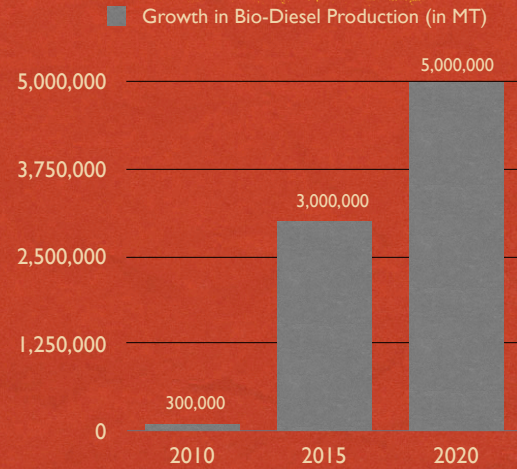


# GROWTH IN CONSUMPTION OF BIO-DIESEL FOR TRANSPORTATION USES

As of the end of 2007 there were nearly 100 bio-diesel projects under construction or in planning. The principal raw materials for these refineries are rapeseed oil, the jatropha tree and imported palm oil. China also uses used cooking oil and other vegetable oils to produce bio-diesel.

Though there is as much as 3 million tpy of bio-diesel refining capacity, output is constrained by a lack of the raw materials.

Some of China's largest energy companies, including Sinopec and Petrochina are actively seeking projects to develop raw materials for bio-diesel production.



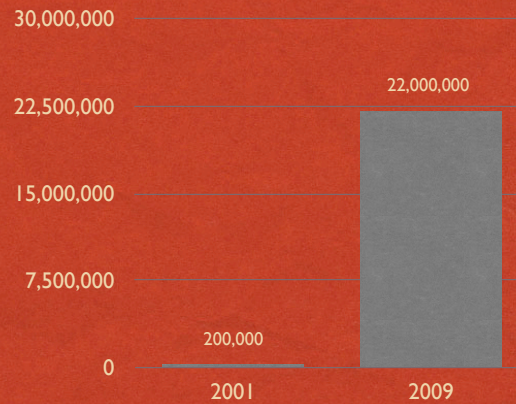
# GROWTH IN CHINA'S HYBRID AND ELECTRIC VEHICLE INDUSTRY

There are now ~65 million electric scooters and bicycles on the road in China today---more than the number of cars.

China accounts for 90% of worldwide sales of electric scooters and bicycles

These two wheel electric vehicles usually are powered by a 250-watt motor driven by a lead-acid battery, provide a driving range of 25-100 kilometers between charges and reach speeds of up to 30 kilometers/hour

■ Output of Electric Scooters and Bicycles (# of units/year)



## GROWTH IN CHINA'S HYBRID AND ELECTRIC VEHICLE INDUSTRY

China is positioning itself as a potential world leader in alternative fuel vehicles.

China's goal is to produce 500,000 electric and hybrid vehicles/year by 2011---this level of production of alternative fuel vehicles would equal ~ 5% of China's total vehicle production.

# THE POWER GRID

## 电网

# THE POWER GRID

## 电网

GOAL: in the next 5-15 years create a unified power grid that serves the whole country (with the exception of Xinjiang, Tibet and Taiwan), brings far-flung (especially renewable) energy generation into the grid and succeeds in reaching rural China.

# THE POWER GRID

电网

## PROJECTS:

- 1) continue construction of three "West to East Power Transmission Lines" totaling 20 GW transmission capability.
- 2) continue to test 1000 Kv Ultra-High voltage AC demonstration projects and begin to construct additional UHV transmission lines, having ~11,000 miles of UHV AC lines by 2012.
- 3) continue development of regional power grids and promote the interconnection of regional grids.
- 4) build "smart grid" capabilities into the emerging national power grid.

# THE POWER GRID

电网

ANTICIPATED  
INVESTMENT: ranges from  
low of \$147 billion U.S. to a  
high of \$590 billion U.S.

LAW AND POLICY FRAMEWORK  
法规与政策



# LAW AND POLICY FRAMEWORK

[《能源法》意见稿全文\(三\)](#)

[《能源法》意见稿全文\(二\)](#)

[《能源法》意见稿全文\(一\)](#)

[中华人民共和国节约能源法](#)

[电网企业全额收购可再生能源电量监管办法](#)

[中华人民共和国清洁生产促进法](#)

[可再生能源发电有关管理规定](#)

[可再生能源发电价格和费用分摊管理试行办法](#)

[中华人民共和国节约能源法](#)

[中华人民共和国可再生能源法](#)

[节能发电调度办法\(试行\)](#)

[关于有序开发小水电切实保护生态环境的通知](#)

[煤炭工业部节约能源监测管理办法](#)

[发改委：我国将出台可再生能源税收优惠政策](#)

[可再生能源中长期发展规划\(五\)](#)

[可再生能源中长期发展规划\(四\)](#)

[可再生能源中长期发展规划\(三\)](#)

[可再生能源中长期发展规划\(二\)](#)

# USING LAW AND POLICY TO FOSTER ENERGY DEVELOPMENT

## SUMMARY OF SELECTED GREEN TECH SUBSIDIES IN CHINA

SUBSIDY	DATE	AMOUNT OF SUBSIDY	ELIGIBILITY
GOLDEN SUN	JULY 2009	50%-70% of investment	300kW minimum capacity
SOLAR ROOFS	MARCH 2009	15-20 yuan/watt of capacity	50kW minimum installation, etc.
PHEV/EV/FC	JANUARY 2009	28K-600K yuan/vehicle	must meet fuel savings standards
WIND TURBINE	AUGUST 2008	600 yuan/kW for 1st 50 units	1MW minimum capacity, etc.
BIOMASS POWER	JULY 2008	tariff increase of 0.1 yuan/kWh	limited to certain types of feedstock
COAL BED METHANE	APRIL 2007	0.2 Yuan/cubic meter	excludes power generation

# USING LAW AND POLICY TO FOSTER ENERGY DEVELOPMENT

- Financial Incentives
  - Tax subsidies and rebates.
  - Subsidies (see chart of selected greentech subsidies in China.
  - Lower VAT rates for renewable energy businesses and higher export tariffs on products which were produced in energy intensive industries.
  - Specialized funds to defray costs in setting up a renewable energy enterprise.

# USING LAW AND POLICY TO FOSTER ENERGY DEVELOPMENT

- Mandatory Implementation:
  - Compulsory installation of solar hot water heaters
  - Industry Permitting Standards (e.g. the aluminum industry). Effectively mandates energy efficiency standards for new construction of industrial projects.
  - Renewable Portfolio Standards (ie., requiring utilities to purchase renewable energy)
  - Requirement that power transmission companies must provide access to the grid for energy generated from renewable sources.
  - Vehicle efficiency standards
  - Feed in Tariffs

# USING LAW AND POLICY TO FOSTER ENERGY DEVELOPMENT

- Better Enforcement:
- Coupling of Renewable Energy Projects with Coal-Fired Power Plant to obtain Approval
- Clean Energy Incentives:
  - Asia's First Carbon Exchange in Beijing is a joint effort of the UN, the Ministry of Science and Technology and the Ministry of Commerce

CHALLENGES AND  
OPPORTUNITIES  
机会与挑战并存

# CHALLENGES AND OPPORTUNITIES

## 机会与挑战并存

### Power Prices:

The dilemma for Beijing is how to increase natural gas, oil and electricity prices to reflect actual supply and demand without causing a more pronounced increase in inflation in China. Chart comparing average price (2008-09 in U.S. \$) in U.S. and China for coal, electricity and water:

Category	China Price	U.S. Price
Coal	\$91.85/MT	\$121.33/MT
Electricity	\$82.96/ MWh	\$115.56/ MWh
Water	\$0.31/MT	\$0.74/MT

天高皇帝远 Problem:

# CHALLENGES AND OPPORTUNITIES

## 机会与挑战并存

### Rationalizing the Administration of Energy and Environmental Policy:

Presently energy policy making is widely dispersed within the National Development and Reform Commission, the Energy Bureau, the Commission on State Owned Assets, the Department of State Owned Lands, the Water Conservancy Department, the Electric Power Regulatory Commission and such SOE as Petro China, Sinopec, the China National Offshore Oil Company, the Shenhua Group and the State Electric Grid.

重复建设和产能过剩的风险：

国产化：



## CHALLENGES AND OPPORTUNITIES 机会与挑战并存

**HUGE OPPORTUNITY:**  
for the U.S. and China to  
cooperate in creating  
what is likely to be a  
bigger economic driver  
than the rise of the  
internet.

Thank You!

Louis B. Schwartz, President  
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