

Energy Practice Group
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China's Energy Market: Overview and Opportunities

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- China's Energy Consumption
- Comparison of China vs. US Consumption

2. Major Energy Sectors

- Coal
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3. Role and Structure of Government and Organizations Influencing Energy Policy

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 - **China's New Energy Law (2009)**
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 - ▶ **Recycling, Efficiency Improvement**
 - ▶ **Foreign Participation**
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 - ▶ **Garbage Collection and Recycling Equipment**



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6. Market Trends

- **More Efficient Traditional Energy**
- **Develop and Expand Renewable Energy**

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- **Solar**
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- **Technology to Improve Energy Efficiency**
- **Technology to Produce Cleaner, Cheaper Energy**
- **Low Carbon Transportation**
- **Low Carbon Finance**

8. Conclusion



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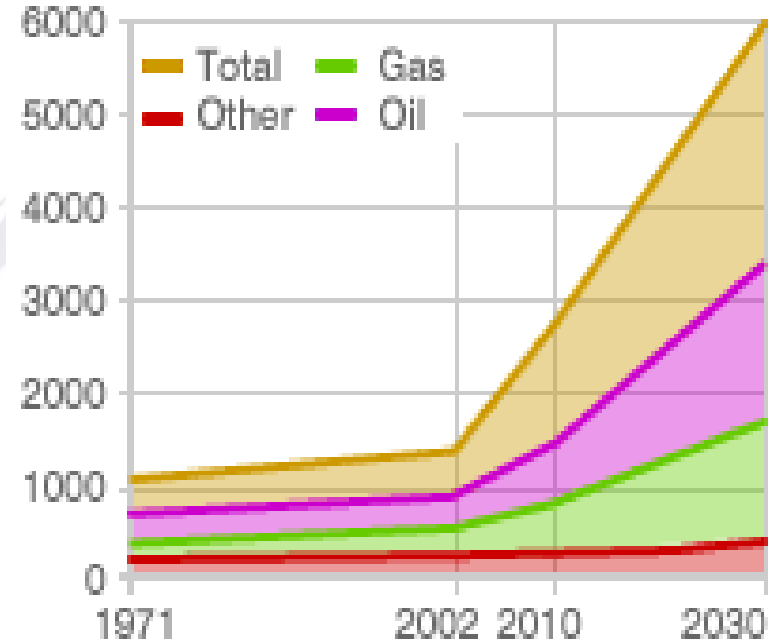
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Overview: China's Energy Consumption

- ✚ Has Exploded Along With Economic Development
- ✚ In 2000, China Consumed Equivalent of 1.5 Billion Tons of Oil
- ✚ By 2010, China's Consumption Expected to Approach 3.0 Billion
- ✚ Consumption Projected to Reach 6.0 Billion by 2030

PRIMARY ENERGY DEMAND IN CHINA

(Million tonnes oil equiv)



SOURCE: IEA



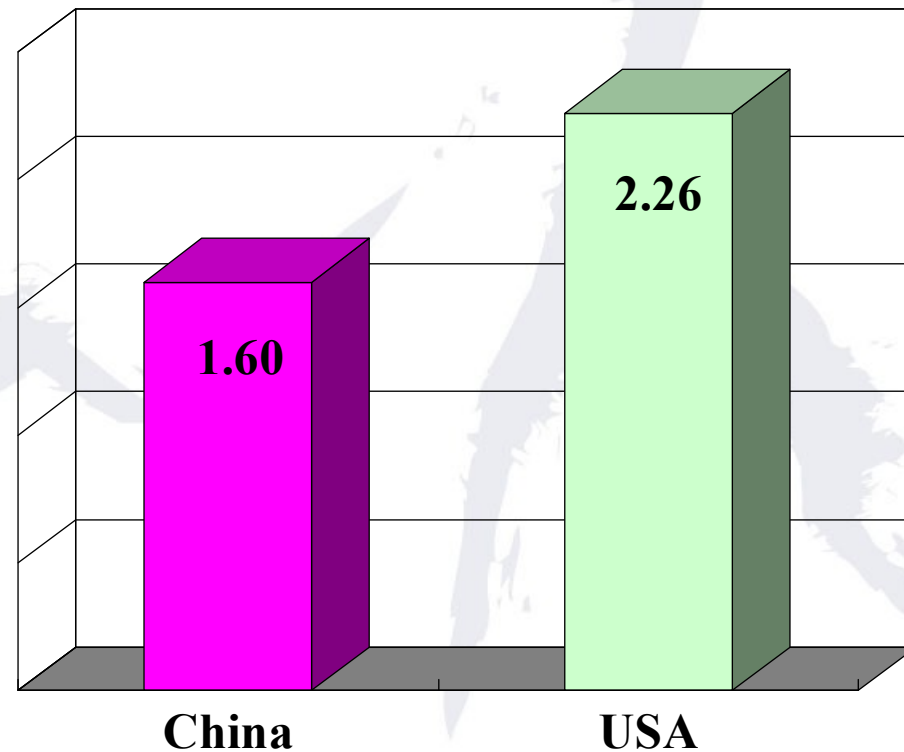
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Overview: China vs. US

**China is the World's
Second-Largest Energy
Consumer, After the
United States**

2007 Energy Consumption

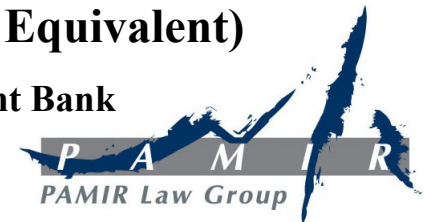


(Billion Metric Tons of Oil Equivalent)

Source: Asian Development Bank



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Overview: China vs. US

- ✚ **China Has Four Times the US Population**
- ✚ **But Last Year, China Only Consumed 73% of the Amount of Energy Consumed in the US**
- ✚ **China's 2007 Per Capita Energy Consumption Only 1/6 of US Level (1.28 Million Metric Tons of Oil Equivalent Per Person vs. 7.66 Million for US)**
- ✚ **But China's Energy Consumption Grew 7.7% in 2007, Accounting For Half of Worldwide Growth**

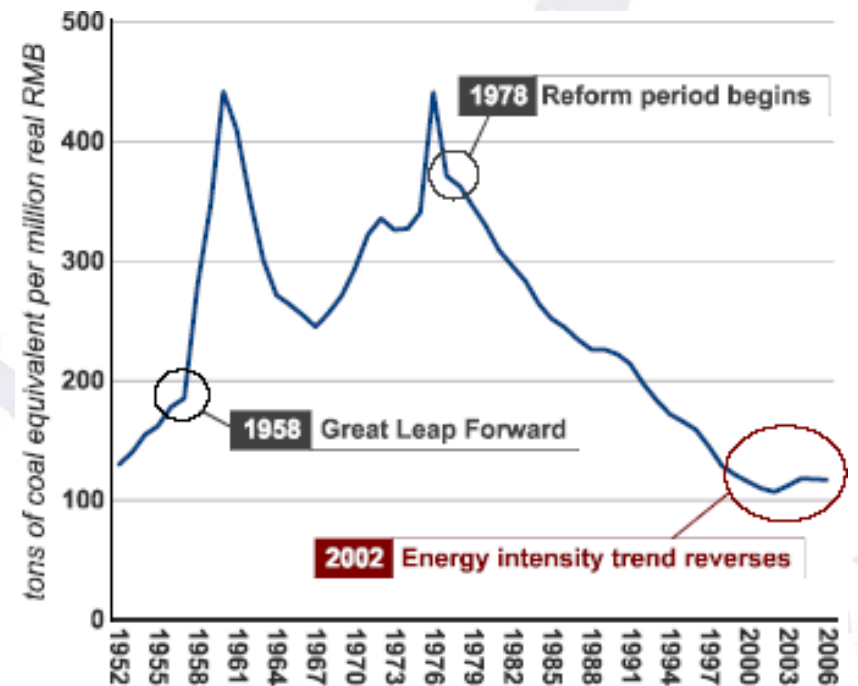


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Overview: Historical Energy Demand

- ✚ Under Mao, China Focused on Energy-Intensive Heavy Industry (Cement, Steel)
- ✚ By 1980s, Market-Oriented Reforms Encouraged Shift to Labor-Intensive Industry
- ✚ By 2000, Energy Intensity (Units of Energy Per Unit of GDP) Had Decreased by 60%



Source: CEIC from China Statistical Yearbook

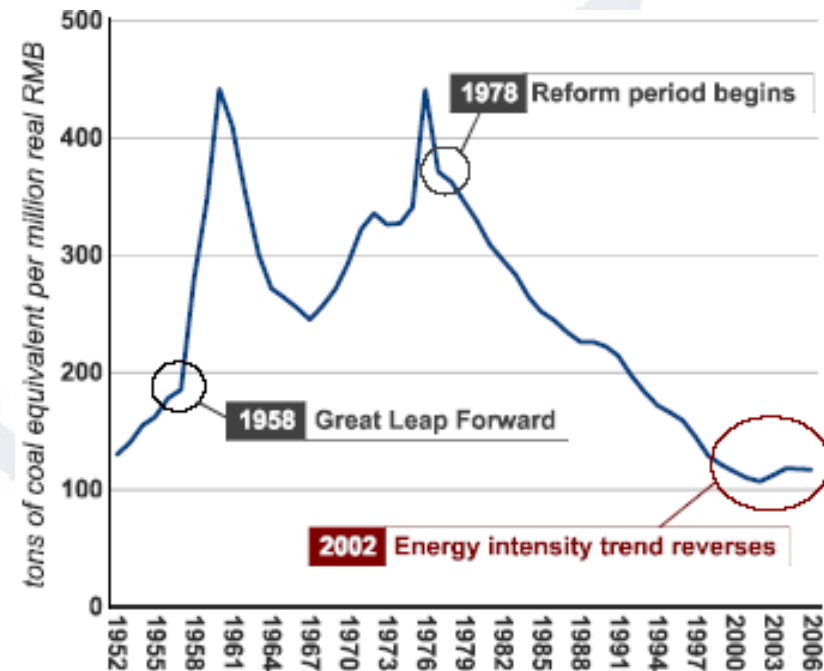


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Overview: Current Energy Demand

- ✚ Energy Intensity Decline Reversed in 2000
- ✚ Energy Consumption Has Grown Four Times Faster Than Predicted
- ✚ But For Now, Heavy Industry is Still Main Consumer of Energy



Source: CEIC from China Statistical Yearbook

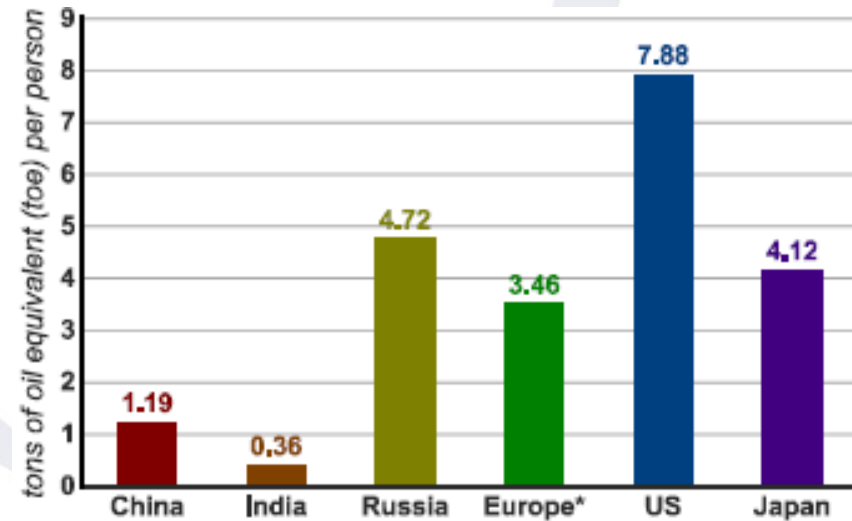


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Overview: Current Energy Demand

- ✚ **China's Per Capita Consumption of Energy Still Relatively Low: 1/6 of US and Less Than 1/4 of Europe & Japan**
- ✚ **China's Consumer Energy Sector Will Experience Strong Growth**



Source: BP Statistical Review and Economist Intelligence Unit (EIU)
* Europe here refers to OECD Europe



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Why Has the Trend Reversed?

- ✚ **Construction Boom Stimulated Investment in Basic Materials Production to Satisfy Local Demand**
- ✚ **Costs Associated With Energy-Intensive Industries Are Low in China**
 - ◆ **Land**
 - ◆ **Labor**
 - ◆ **Construction**
 - ◆ **Regulatory Compliance**
- ✚ **Competition Between Local Governments to Attract Investment**
- ✚ **Increasing Production For Global Export Market**

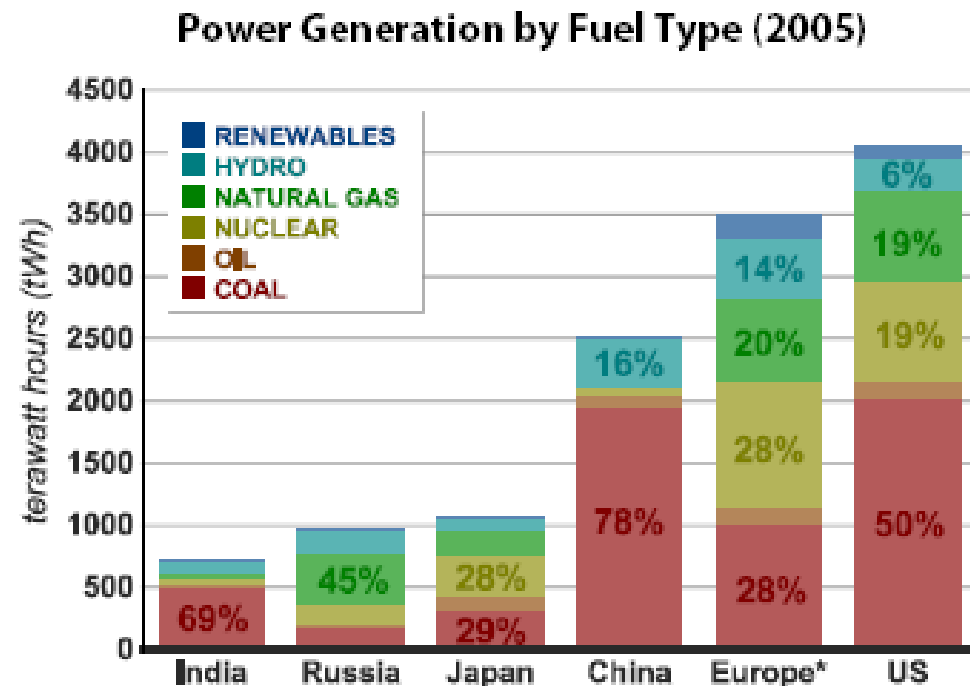


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Major Energy Sectors

Coal is Primary Source of China's Energy (78%), Hydro Is Distant Second (16%), Followed by Nuclear 1.9%



Source: IEA, EIA, BP Statistical Review, CEIC and author's estimates
* Europe here refers to OECD Europe

Coal

✚ Largest Players:

- ◆ Shenhua Group
- ◆ China National Coal
- ◆ Datong Coal

✚ 13% of Global Coal Reserves Are in China

✚ Highly Fragmented Supply:

- ◆ Shenhua is World's Largest Coal Producer, Yet Accounts For Only 9% of China's Domestic Supply



神华集团有限责任公司

SHENHUA GROUP CORPORATION LIMITED



同煤集团



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Oil and Gas



中国海洋石油总公司
CHINA NATIONAL OFFSHORE OIL CORP.

Largest Players

- ✚ **China National Petroleum Corporation (CNPC)**
 - ◆ **World's 5th Largest Oil Producing Company**
- ✚ **China Petroleum and Chemical Corporation (Sinopec)**
 - ◆ **Dominant in Refining Sector**
- ✚ **China National Offshore Oil Corporation (CNOOC)**
 - ◆ **Almost Exclusively Upstream, Very Few Refining Projects**



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Oil and Gas

- ✦ **Overseas Expansion**
- ✦ **Forced by Limited Domestic Supplies and Thin Margins in Downstream Activities**
- ✦ **But Often Complicated by Domestic Politics in Target Country, PR and Regulatory Compliance Difficulties**

(Example: CNOOC's Ill-Fated Bid to Acquire Unocal in 2005)



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Role of Government

- ✦ **China's Government Plays an Active Macroeconomic Role in Crafting Development of Energy Sector**
- ✦ **Government Seeks to Develop Cheap, Renewable and Environmentally Friendly Energy Resources**
- ✦ **Government Seeks to Reduce Dependence on Energy Imports**
- ✦ **Government Seeks to Upgrade Industrial Structure, Reduce Unsound Aspects of Growth and Raise Living Standards for Ordinary Citizens**
- ✦ **Large Energy Producers Have Strong Influence Over Government Policy-Making**



Important Government Departments

**These Are the Main Chinese Government Entities
Influencing and Regulating China's Energy Sector:**

**National Development
and Reform
Commission (NDRC)**

**NDRC
Energy Bureau**

Approves
Large Energy Projects,
Makes Policy
Recommendations
to NDRC

**NDRC
Price Bureau**

Sets Fuel
and Electricity
Prices

Ministry of Industry

Sets Industry Policy
And Approves
Large Industrial Projects

**Ministry of
Environmental Protection**

Sets and Enforces
Environmental Standards



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Battle of the Bureaucrats

- ✚ **“Power” Struggle: Energy Policy-Making Power the Focus of Bitter Struggle Among Government Departments**
- ✚ **Traditionally, the National Development and Reform Commission (NDRC), China’s Top Economic Policy-Making Body, Reigned Supreme Over Energy Policy**
- ✚ **Earlier This Year, Chinese President Hu Jintao Implemented Reforms Handing Some of NDRC’s Power to New “Super-Ministries”**
- ✚ **But Opposition From NDRC and Power Suppliers Defeated Plans For New “Super” Ministry of Energy**
- ✚ **As a Result, Many Things Still Falling Through Cracks**



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NDRC vs. New “Super-Ministries”

- ✚ **New Environmental Protection Ministry Given Power to Set and Enforce Higher Environmental Protection Standards**
- ✚ **New Ministry of Industry Given Power to Set and Enforce Industry Policy, Including Power to Approve Large-Scale Industrial Projects**
- ✚ **Environment, Industry Ministries Report Directly to Chinese Leadership Without Going Through NDRC**
- ✚ **Planned New “Ministry of Energy” Would Have Assumed Power to Regulate Energy Sector and Set Prices – But Shot Down by NDRC and Large Energy Producers**



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NDRC's New Energy Bureau

- ✚ **A New Vice-Ministerial Body Based In Office Across Town From NDRC's Beijing Headquarters**
- ✚ **Has Taken Over NDRC's Former Role as China's Energy Industry Management Institution**
- ✚ **Has Power to Approve Large Projects, Energy Production, Research and International Cooperation and Makes Recommendations on Energy Pricing**
- ✚ **But NDRC's Price Bureau Retains Key Final Approval Power on Energy Pricing**
- ✚ **Bureau Still Expected to Upgrade Into Independent "Ministry of Energy" Within 5 Years**



Government Advisory Bodies

State Energy Leading Group

Directs NDRC on Energy-Related Issues, Headed by Premier Wen Jiabao

State Energy Leading Group Office

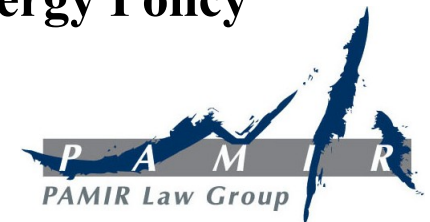
Housed in NDRC, Carries Out Leading Group's Policies, Headed by NDRC Chief

National Development and Reform Commission (NDRC)

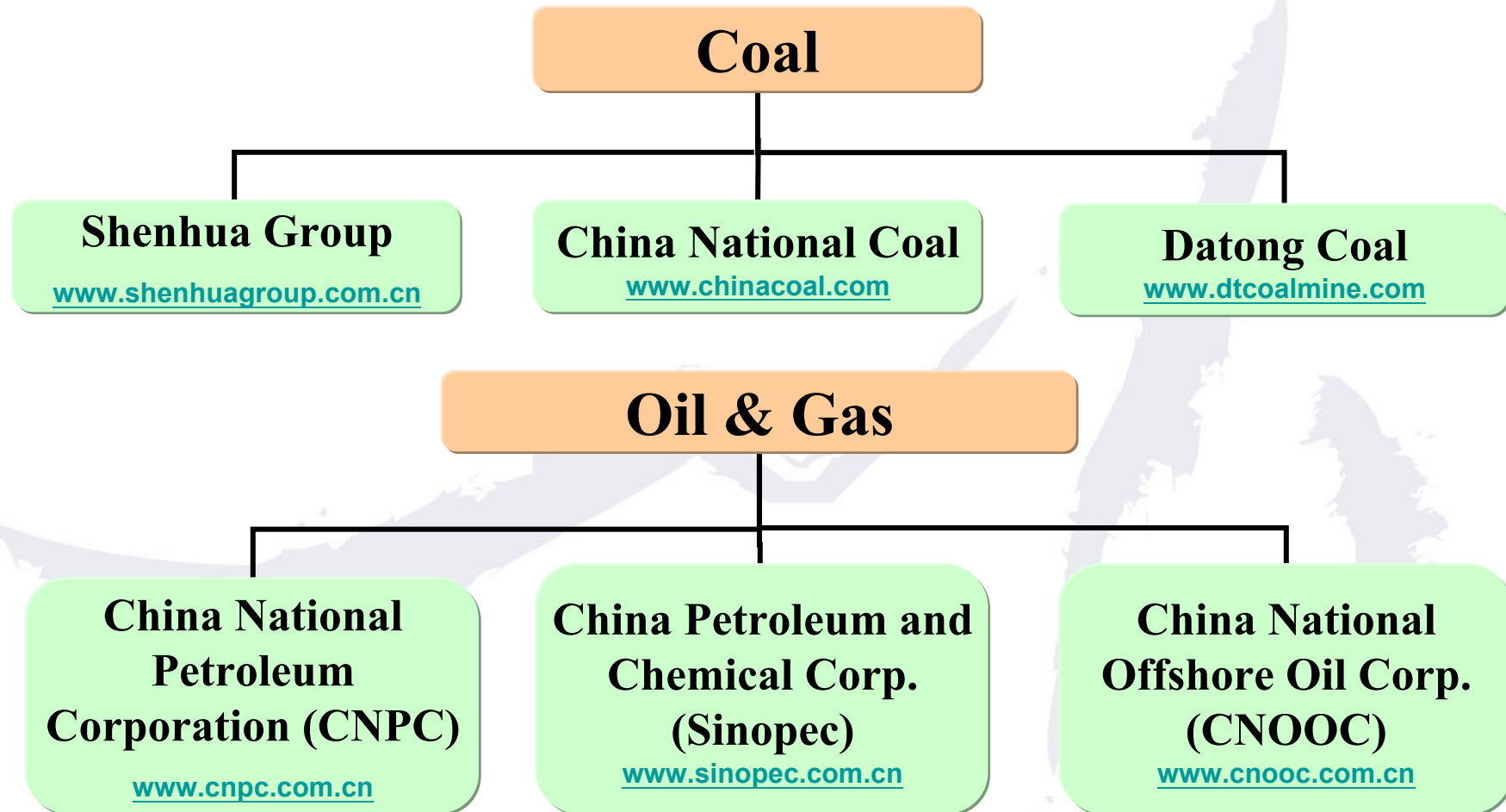
On Paper, These Bodies Are Over the NDRC – But They Do Not Meet Often and in Practice, NDRC Retains Most Influence in Making Energy Policy



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Large Energy Producers



Large Energy Producers Have Strong Influence Over Government

- ✚ **Large Energy Producers Are Organized as Companies**
- ✚ **But Large Producers Are Better Funded and Have Larger Research Departments Than Government Regulators**
- ✚ **In Reality, Chinese Regulators Depend on Large Energy Producers For Key Input on Making Important Energy Policies and Decisions**



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Other Indirect Channels of Government Influence

- ✚ **State-Owned Assets Supervision and Administration Commission (SASAC)**
 - ◆ **Major Shareholder in Large State-Owned Energy Producers**
- ✚ **Ministry of Personnel**
 - ◆ **Appoints Senior Leadership of State-Owned Energy Producers**

What is Fueling China's Green Revolution?

- ✚ **Renewables Investment and Installed Capacity are Growing Quickly and Expected to Double by 2010**
 - ◆ **Hydro: China Has Already Overtaken Canada to Become World's Biggest Producer of Hydroelectric Power**
 - ◆ **Wind: World's No. 5, After US, Germany, India and Spain**
- ✚ **China Is or Will Become the Leading Manufacturer of Critical Low Carbon Technologies**
 - ◆ **Solar PV**
 - ◆ **Wind Turbines**
 - ◆ **Solar Water Heaters**
 - ◆ **Electric Vehicles Including Cars and Bicycles**
 - ◆ **Rechargeable Batteries**
 - ◆ **Energy Efficient Home Appliances**



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What is Fueling China's Green Revolution?

- ✚ **China is Becoming a Leader in Low Carbon Transportation**
 - ◆ **Vehicle Emission Standards 40% Higher Than US**
 - ◆ **Over 21 Million Electric Bicycles Sold**
 - ◆ **1.64 Million Energy Efficient Compact Cars Sold**
 - ◆ **China is Already World's Third-Largest Ethanol Producer**



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What is Fueling China's Green Revolution?

- ✚ **Strong Policy and Regulatory Framework:**
 - ◆ **Home Appliance Efficiency Standards**
 - ◆ **20% Tax on SUVs**
 - ◆ **Building Efficiency Design Codes**
 - ◆ **Renewable Energy Law, Circular Economy Law, “Green Reporting” Standards For Listed Companies, New “Energy Law”**



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Opportunities: China's Renewable Energy Law

- ✚ **Enacted in 2006**
- ✚ **Provides Financial Subsidies and Tax Incentives For Renewable Energy Sources**
- ✚ **Subsidies Will Be Gradually Reduced After 2010**
- ✚ **Sets Goal of Boosting China's Renewable Energy Capacity to 15% By 2020**
- ✚ **Commitment to Invest US\$180 Billion in Renewable Energy Between 2006-2010**



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Opportunities: China's Circular Economy Law

- ✚ **In China, “Circular Economy” is Synonymous With “Sustainable Economy”**
- ✚ **Circular Economy Law Passed Last Month and Will Take Effect January 1, 2009**
- ✚ **Law Will Enforce Higher Environmental Standards on Major Chinese Companies**
- ✚ **Government Will Enforce Stricter Standards on Energy Suppliers and High Energy-Consuming Industries**
- ✚ **Example: Listed Companies “Green Reporting” Standards Requirement**



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Opportunities: China's New Energy Law

- ✦ **Expected to Be Enacted by Late 2009**
- ✦ **Will Supersede All Laws Governing Traditional and Renewable Energy Sectors**
- ✦ **Will Establish Central Coordination of Energy Policy – Possibly Even a New “Energy Ministry”**
- ✦ **Will Expand Current Subsidies and Create New Tax Incentives For Renewable Energy**
- ✦ **Will Impose Tax Restrictions to Discourage High-Energy Consuming Products**



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Opportunities: Energy Efficiency

- ✚ **China Aims to Reduce Energy Intensity of GDP 20% by 2010**
- ✚ **In 2006, China Introduced a New Building Code Requiring All New Buildings to Reduce Energy Consumption by 50%, or even 65% in Beijing and Shanghai**
- ✚ **Over 10% of Chinese Homes Use Solar Water Heaters and in 2006, China's Market Was Worth US\$2.6 Billion, 60% of Global Total**
- ✚ **China Has Developed One of the World's Most Comprehensive Mandatory Energy Efficiency Standards and Labels for Home Appliances**



Opportunities: New Green Reporting Standards

- ✚ **In Mid-2008, Stock Markets in Shanghai and Shenzhen Implemented “Green Reporting” Standards for Listed Companies**
- ✚ **CSRC Will Make Public the Names of Companies That Fail to Report, and Compile an Annual Ranking of Companies Based on Environmental Performance**
- ✚ **Environment Ministry Has Started by Focusing on High-Energy Consumption and High-Pollution Companies**



Opportunities in Traditional Energy Sectors

Caveat: While Foreign Participation in Traditional Energy Production is Banned, Opportunities Abound in Cleaning Up Traditional Energy and Making It More Efficient



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Foreign Participation in China's Energy Sector

- ✚ **China's "Guidance Catalogue for Foreign Investment Industries" Bars Most Foreign Investment in Heavy-Polluting Energy Industries**
- ✚ **Foreign Investors Barred From Conventional Production and Supply of Gas and Electricity**
- ✚ **Foreign Investment No Longer Encouraged in Projects Involving Important or Scarce Mineral Resources or Non-Renewable Energy (Such as Mining)**



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Foreign Participation in China's Energy Sector

+ But Foreign Investment is Strongly Encouraged in:

- ◆ **Renewable Energy**
- ◆ **Recycling**
- ◆ **Clean Production Techniques**
- ◆ **Environmental Protection Methods**

+ Example: Foreign Investment in Mining is Banned, Yet Encouraged For Utilization of Mine Gas or Improving Efficiency of Mining Operations



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Foreign Participation in China's Energy Sector

Foreign Investment Encouraged For Exploration and Exploitation of Non-Conventional Oil Resources:

- ◆ Oil Shale
- ◆ Oil Sand
- ◆ Heavy Oils
- ◆ Extra-Heavy Oils

Caveat: Foreign Energy Sector Investors Must Usually Enter Into Joint Venture With Chinese Party



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Opportunities: Renewable Energy

- ✚ **Unlike China's Traditional Energy Sectors, Renewable Energy is Wide Open to Foreign Investment and Participation**
- ✚ **Related Technology and Production Also Open to Foreign Participation:**
 - ◆ **Solar Cell Manufacturing**
 - ◆ **Anti-Pollution Equipment**
 - ◆ **Equipment for Processing Urban Waste**
 - ◆ **Garbage Collection and Handling Equipment**
 - ◆ **Recycling**



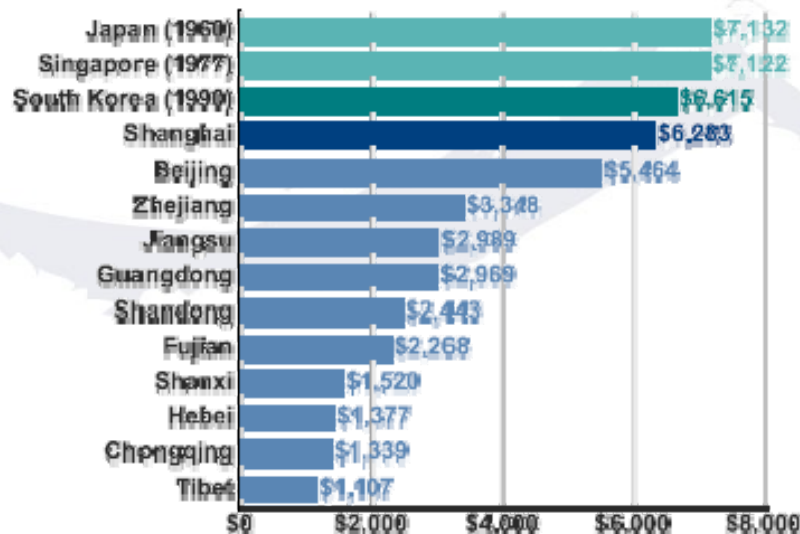
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Market Trends

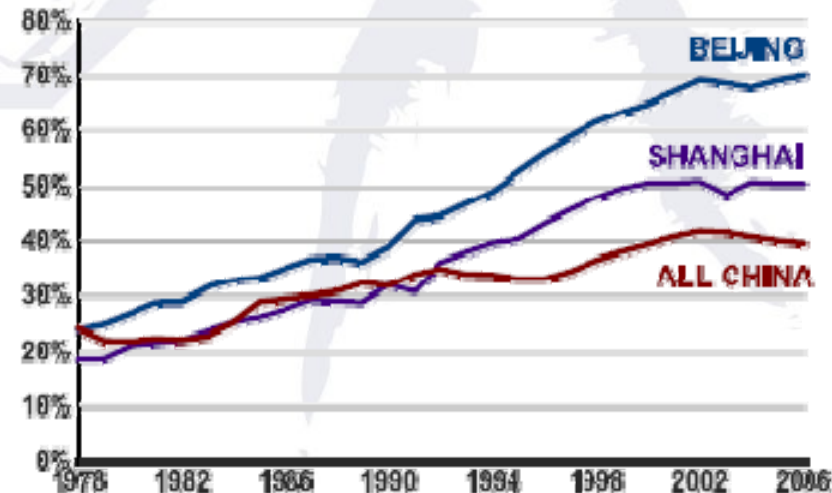
- ✚ Energy Demand Switching From Heavy Industry to Consumer, Commercial and Transportation
- ✚ GDP Reaching Levels Where Energy-Intensive Goods Such as A/C and Automobiles Are Within Reach
- ✚ GDP of Beijing and Shanghai Provide a Glimpse Into Future Demand Levels

Figure 12: Per Capita GDP by Province (real 2005 USD)



Source: WB and CIA from China Statistical Yearbook, Population is from Chinese census data.

Figure Service Sector as a Share of GDP, Select Provinces/Municipalities and China as a Whole



Source: CIA from China Statistical Yearbook



Market Trends

+ Increased Efficiency in Traditional Energy Sources

- ◆ Clean Coal
- ◆ Liquefied Natural Gas (LNG)

+ Renewable Energy Sources

- ◆ Hydro
- ◆ Solar
- ◆ Wind
- ◆ Biomass

+ Energy Efficient Vehicles

- ◆ Automobiles
- ◆ Public Transportation
- ◆ Electric Bicycles



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Market Trends

- ✚ **China Has Reduced Energy Intensity (Units of Energy Per Unit of GDP) by Over 60% Since 1980 and Has Set a Target of Further Reducing 20% by 2010**
- ✚ **China is a Leading Manufacturer of Solar PV and Leading Producers Enjoy a Combined Market Value of US\$15 billion**
- ✚ **Global Wind Energy Council Expects China to Become World's Leading Wind Turbine Manufacturer by 2009**
- ✚ **Chinese Manufacturers Command 60% of the Global Solar Water Heater Market**



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Market Trends

- ✚ **China's Urban Population Projected to Increase 350 Million Between 2006 and 2025, So Increased Demand for Energy, Buildings and Products Must be Carefully Managed**
- ✚ **In 2004, an Estimated 23% of China's Energy Demand (and CO2 Emissions) Originated From Export Manufacturing, Raising the Issue of International Responsibility for Global Emission Reductions**
- ✚ **China Has a Building Stock of Over 43 Billion Square Meters, of Which Only 4% Meets the New Building Code's Energy Efficiency Standards**



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Market Trends

- ✚ **The Building Code Will Generate Huge Demand for Green Building Design and Materials Companies Estimated to be Worth US\$1.5 Trillion Between Now and 2020**
- ✚ **China's Government is Targeting Thousands of Factories Which Have Efficiencies in the Lowest Quartile to Improve Efficiency or Shut Down, Prompting Hundreds of Billions of US Dollars in Investment in Energy Efficient Technology**
- ✚ **China Seeks to Have Solar Water Heaters Installed in 30% of Households by 2020, and There is Also a Potentially Large Export Market**



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Market Trends

- ✚ **As More Efficient Transport Technologies, Such as Compact Cars, Become More Affordable, People Will Be Encouraged to Switch From Less Efficient Transport Modes (Such as Large Cars), But Could Also Switch Away From More Efficient Options (Such as Electric Bikes)**
- ✚ **Biofuel Development in China Must Accommodate Concerns Over Food Security and Pricing**



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Growth Sectors

+ Chinese Entrepreneurs Are Taking Advantage of Available Funding For Cleantech Ventures

+ Hot Sectors:

◆ **Solar**

◆ **Wind**

◆ **Hydro**

◆ **Biomass**

◆ **Technology to Improve Energy Efficiency**

◆ **Technology to Produce Cleaner, Cheaper Energy**



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Solar

- ✚ **China is World's #2 Producer of Solar PV Technology**
- ✚ **China Boasts Over 400 Solar PV Companies**
- ✚ **4 Chinese Companies Have Market Caps Exceeding US\$2 Billion:**

◆ **Suntech Power** 

◆ **LDK Solar**



World Class Solar Wafer Manufacturer

◆ **JA Solar**

JA SOLAR

◆ **Yingli Solar**



- ✚ **Growth Fueled by Demand in Europe and US**

- ✚ **Large Untapped Domestic Market (Only 0.08 KW Installed Capacity)**



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Wind

- ✚ **China Experienced 125% Wind Market Growth in 2007**
- ✚ **7% (6GW) of Global Installed Capacity (5th in the World after Germany, US, India and Spain)**
- ✚ **Experts Predict that Installed Capacity Might Reach up to 100GW by 2020**
- ✚ **Regulations in Place to Encourage Local Production (70% of all Turbines Must be Domestically Manufactured)**
- ✚ **Biggest Players:**

◆ **Goldwind**

◆ **Sinovel**



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Hydro

- ✚ **China Has World's Largest Installed Capacity**
- ✚ **Avoids 450 Million Metric Tons of CO2 Emissions**
- ✚ **Capacity Expected to Double by 2020**



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Biomass

- ✚ **2 GW Installed Capacity**
- ✚ **Over 1,600 Industrial Scale Biogas Plants and Over 18 Million Household Digesters for Cooking, Heating and Power**
- ✚ **Currently Over 50 Municipal Waste-to-Energy Plants Processing Over 3 Million Tons of Garbage Per Year**
- ✚ **Agricultural Waste Could Provide As Much As 800 Million Metric Tons of Biomass Per Year**



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Opportunities in Low Carbon Technologies

- ✚ **Private Transportation**
- ✚ **Public Transportation**
- ✚ **Finance**



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Key Players

Himin Solar Energy



- ◆ Largest Solar Water Heater Manufacturer With Annual Revenues of US\$280 Million

Broad



- ◆ Largest Producer of Heating and Cooling Systems
- ◆ Broad's Systems Emit 75% Less Carbons than Traditional Units

Vanke



- ◆ China's Largest Residential Property Developer
- ◆ Utilizes Techniques That Reduce Waste by Up to 91%
- ◆ Will Build Over 1 Million Square Feet of Green Buildings in 2009



Low Carbon Transportation

- ✚ **China's Low Carbon Vehicle Market is Expanding Rapidly**
- ✚ **China Produced 79 Million Bicycles, 21 Million Electric Bicycles and 1.64 Million Energy-Efficient Compact Cars in 2007**
- ✚ **China Has a 36 MPG Fuel Economy Standard for Passenger Vehicles, 40% Higher Than the US Standard, and Collects Excise Tax of Up to 20% on Gas-Guzzling SUVs**
- ✚ **China Has Begun Planting Marginal Land Half the Size of England With Biofuel Forests Capable of Producing 6 Million Metric Tons of Biodiesel Per Year by 2020**



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Low Carbon Transportation

- ✚ **Low Carbon Transport Solutions Are Essential, as Sales of Traditional Automobiles Rose 21% in 2008**
- ✚ **China is Expected to Overtake the US as the World's Largest Car Market by 2015**
- ✚ **Large-Scale Investment in Public Transport Needed to Meet Demands of China's Urban Population Doubling by 2030**



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Low Carbon Transportation

Hybrid Vehicles

- ◆ **Tax Policy and Government Sponsored Research Programs Encourage Domestic Production**
- ◆ **Hybrid Vehicles From Dongfeng, Chery and Chang'An Utilizing Batteries by BYD and Retail for 50% of the Cost of a Prius**

Electric Bicycles

- ◆ **Domestic Market Worth US\$6 billion**



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Low Carbon Finance

- ✚ **China is the World's Second-Largest Recipient of Sustainable Energy Investment After Germany, With Approximately US\$12 Billion Invested in 2007**
- ✚ **China is the Leading Beneficiary of the United Nations Clean Development Mechanism (CDM) and Has Developed Projects to Reduce 900 Million Metric Tons of CO2 Emissions by 2012, Valued at Over US\$10 billion**
- ✚ **The Chinese Government Plans to Invest Over 41 Billion Yuan (US\$6 billion) in Energy Efficiency Projects in 2008**



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Low Carbon Finance

- ✚ **Funneling International Investment and Assistance Into Carbon Reduction Projects in China Has Had Mixed Success**
- ✚ **There Has Been Criticism of the Effectiveness of Some CDM Projects Such as Those Reducing Hydrofluorocarbons (HFCs)**
- ✚ **Most Chinese Banks Remain Unfamiliar With Financing Energy Efficiency Projects and Continue to Focus on Large Infrastructure Development Projects**



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Low Carbon Finance

- ✚ **Stronger Policies From the Chinese Government are Creating Increased Demand for Low Carbon Investment, Including a Projected US\$398 Billion for Renewable Energy Over the Next 15 Years**
- ✚ **China's Energy Service Companies (ESCOs), Which Provide Innovative Financing for Energy Efficiency Projects, Are Growing Strongly and the Market Is Expected to Grow to US\$1 Billion by 2009**

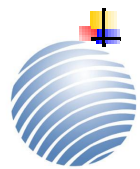


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Conclusion

- ✚ **China's Energy Sector Is Fraught With Unprecedented Opportunities**
- ✚ **Chinese Term For “Crisis” (危機) Comprised of Two Characters:**
 - ◆ **危 “Wei” Meaning “Danger”**
 - ◆ **機 “Ji” Meaning “Opportunity”**
- ✚ **Key to Success is Showing How Your Client's Investments or Business Activities Help China Meet Her Energy Objectives**
- ✚ **China's Business Environment is Complicated and Professional Help is Essential, Not Optional**



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