CERA scenarios for China's energy supply and demand

剑桥能源研究协会在中国能源供应与需求方面的分析

Dr. Bob Lockwood –
Senior Vice President, China and Far East, IHS (parent company of CERA)

IHS（CERA 的母公司）
中国及远东区资深副总裁

Massachusetts Institute of Technology

MIT Forum on the Future of Energy in China

Dawn of a New Age: Implications for China

Prepared by CERA for

MIT Forum on the Future of Energy in China

April 2007

Dr. Bob Lockwood

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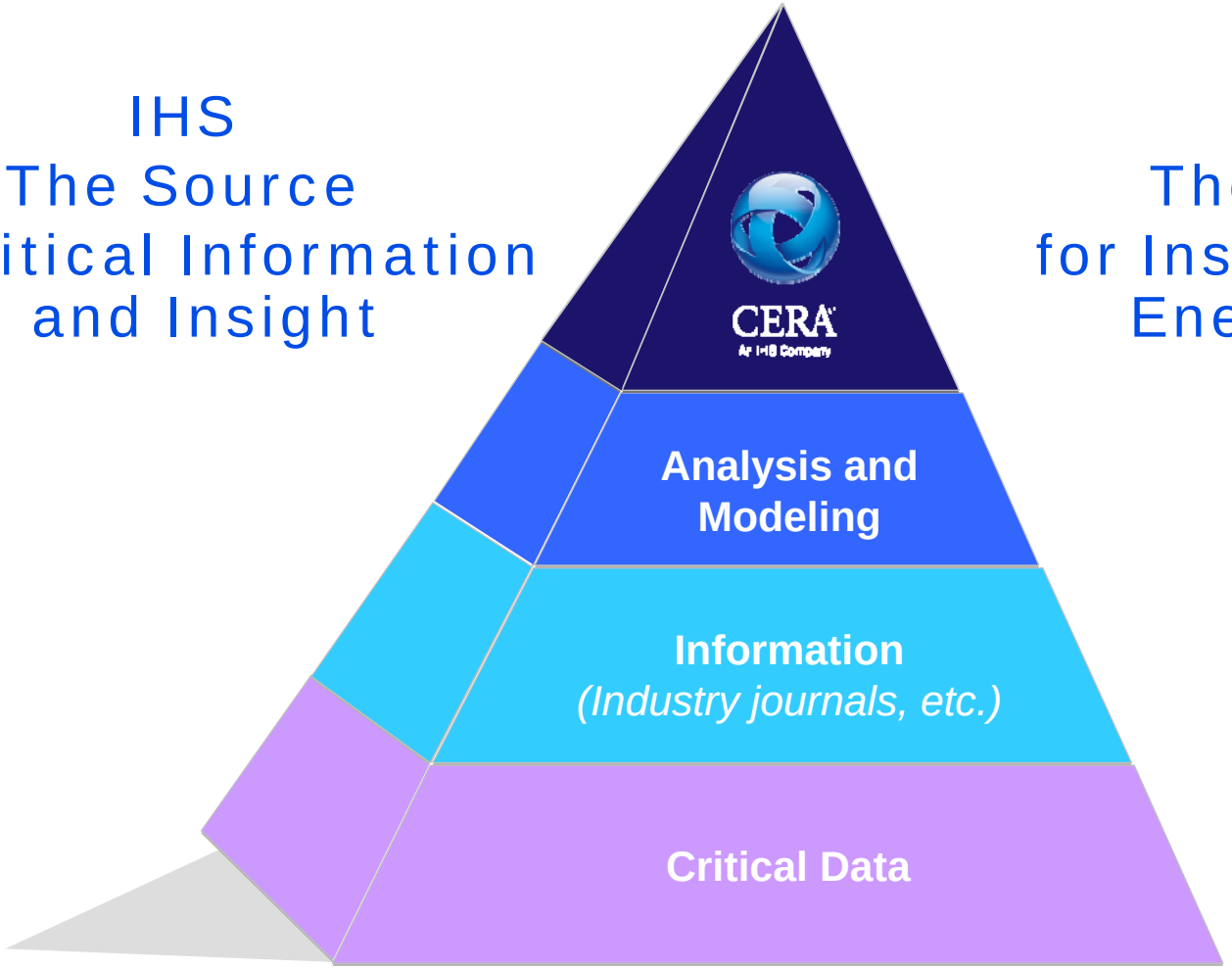
About IHS and CERA

IHS
The Source
for Critical Information
and Insight



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Energy Future

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Summary of Our Approach to Scenarios

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CERA's Analytic Approach to Long-term Strategic Planning: The Scenario Process

1. Scenarios provide a structured process for energy companies to examine strategic issues

2. Scenarios expand analysis beyond a single future and linear forecasting

3. Scenarios provide a framework for testing strategic decision-making

4. CERA's most recent scenario work- *Dawn of a New Age* - is the result of an extensive year long analysis

Source: Cambridge Energy Research Associates.
50714-1

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Our Scenario Process

INPUTS

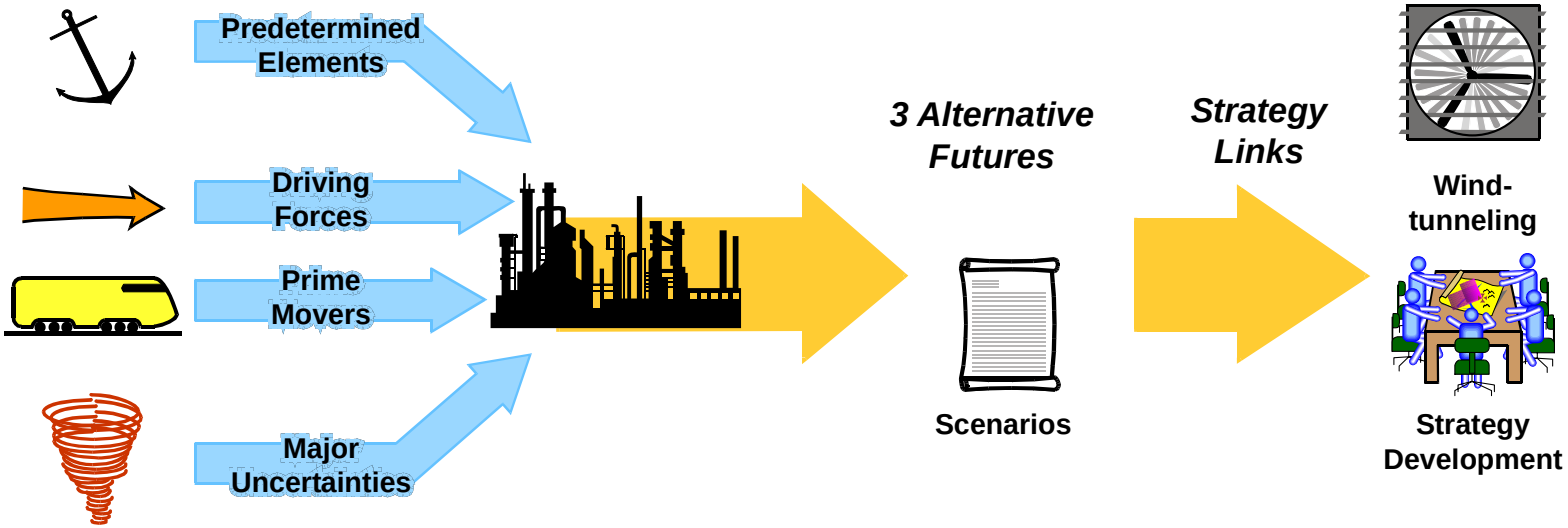
Factors that will shape the future

SCENARIOS

Refine inputs into 3 credible views of the energy future

STRATEGY

Apply scenarios to develop and test strategies



Source: Cambridge Energy Research Associates.

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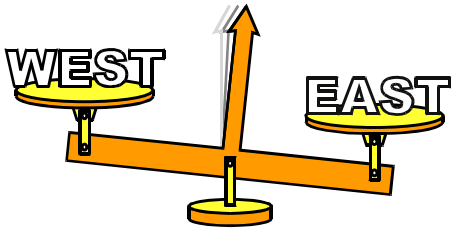
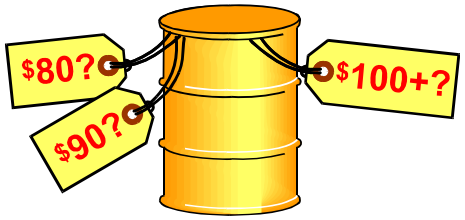
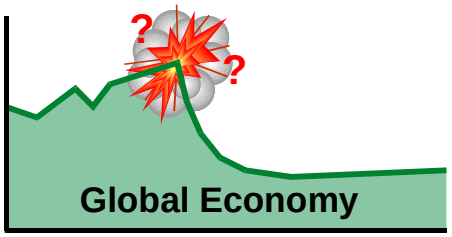
Critical Questions Addressed in the Global Energy Scenarios



ASIAN PHOENIX. How is the rise of Asia altering the global balance of power? What does it mean for geopolitics and the energy industry?



BREAK POINT. How high can oil prices rise? What would it take to drive oil above $100 per barrel? How would the world react?



GLOBAL FISSURES. How would a world faced with a sustained slowdown in global economic growth and integration affect energy demand and long-term investment in the energy industry?

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Source: Cambridge Energy Research Associates.
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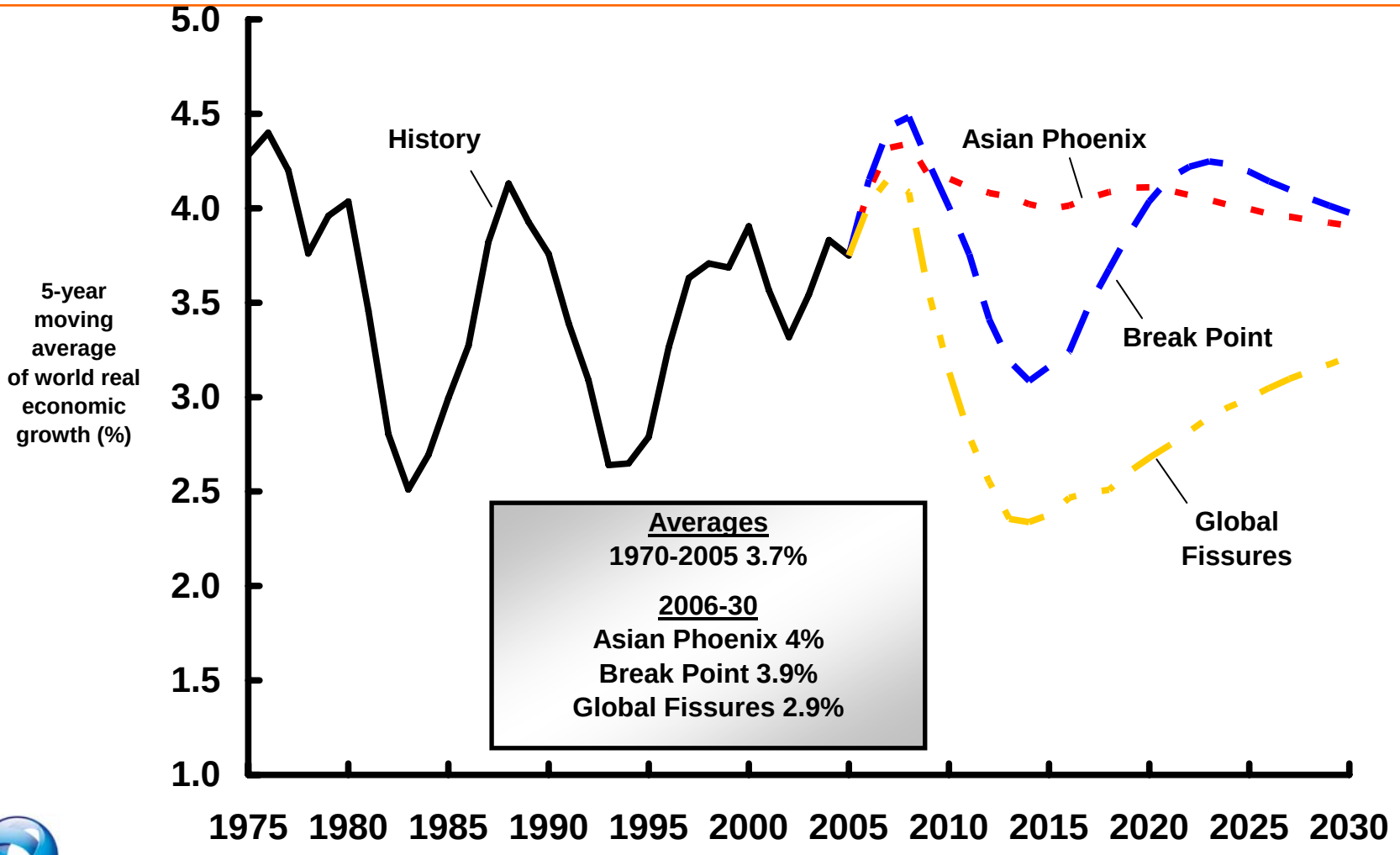
SUMMARY OF DNA SCENARIOS

Global Real Economic Growth



Source: Projections from Cambridge Energy Research Associates. Historical data from the International Monetary Fund. World economic growth calculated on a purchasing power parity basis.

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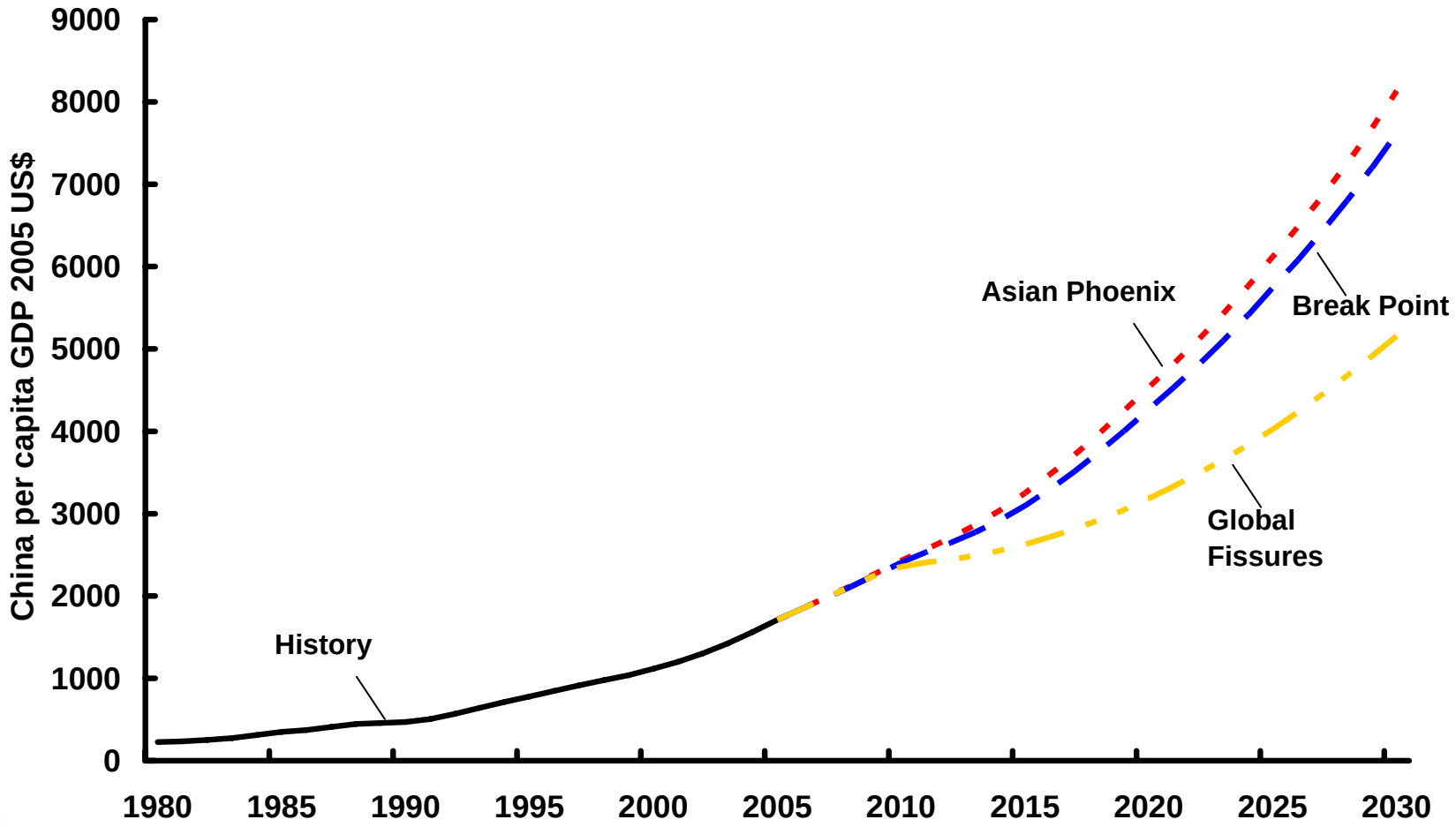
SUMMARY OF DNA SCENARIOS

China per capita GDP



Source: Projections from Cambridge Energy Research Associates. Historical data from the International Monetary Fund. World economic growth calculated on a purchasing power parity basis.

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We begin with 4+1 questions...

0. Is it possible that the Chinese economy grow to be such a major force in the world economy by 2030?

1. How does the global energy mix change over the period to 2030 in each scenario?

2. What happens to oil prices and demand in China over the period to 2030 in each scenario?

3. How does the Power Generation Mix in China change over the period to 2030 in each scenario?

4. How do CO2 emissions develop over the period to 2030 in each scenario?

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Question 0: Can this happen?

Is it possible that the Chinese economy grow to be such a major force in the world economy by 2030?

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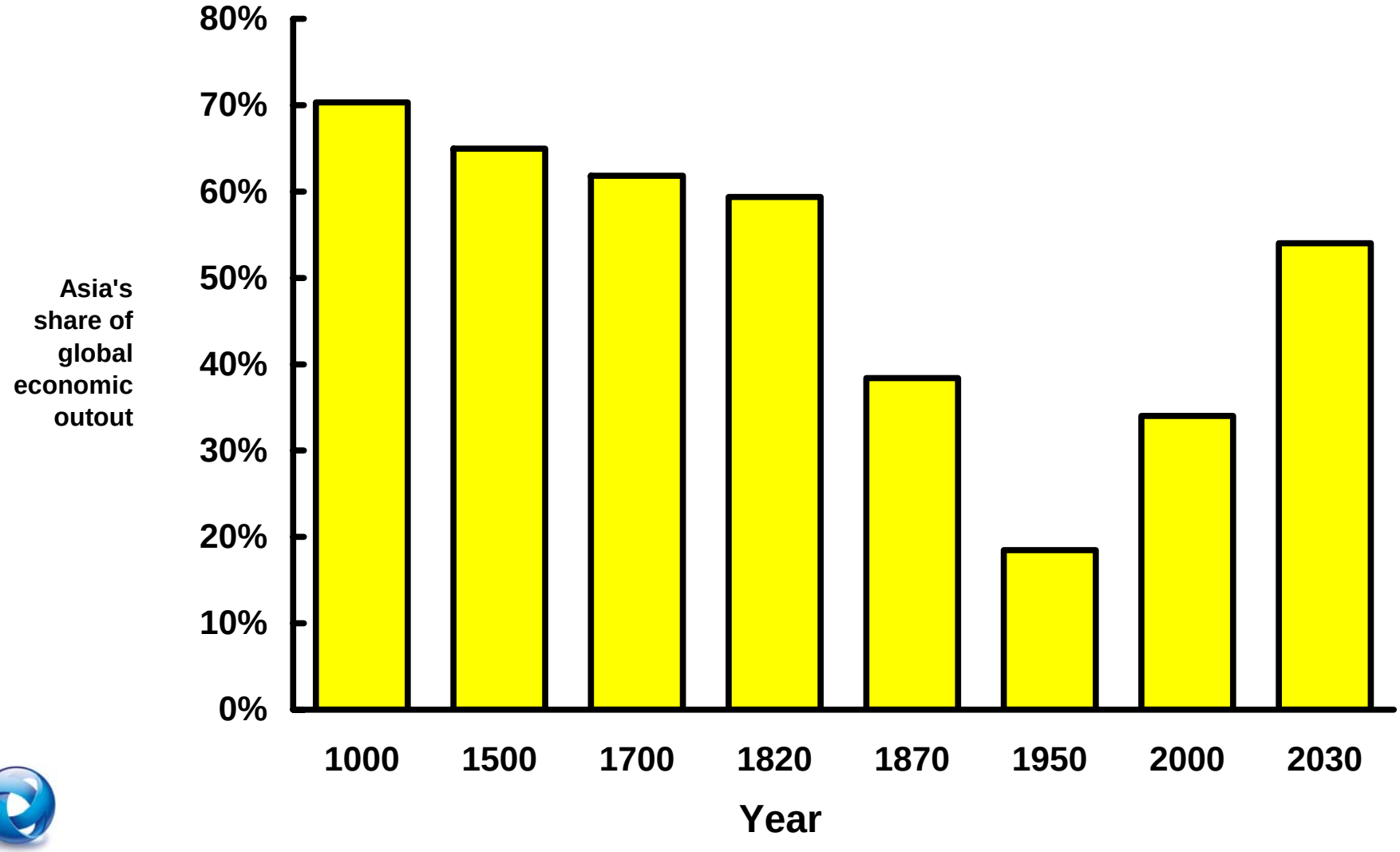
Asia's Share of Global Economic Output:

Year 1000 to 2030



Source: Projections from Cambridge Energy Research Associates. Historical data from the IMF and the OECD.

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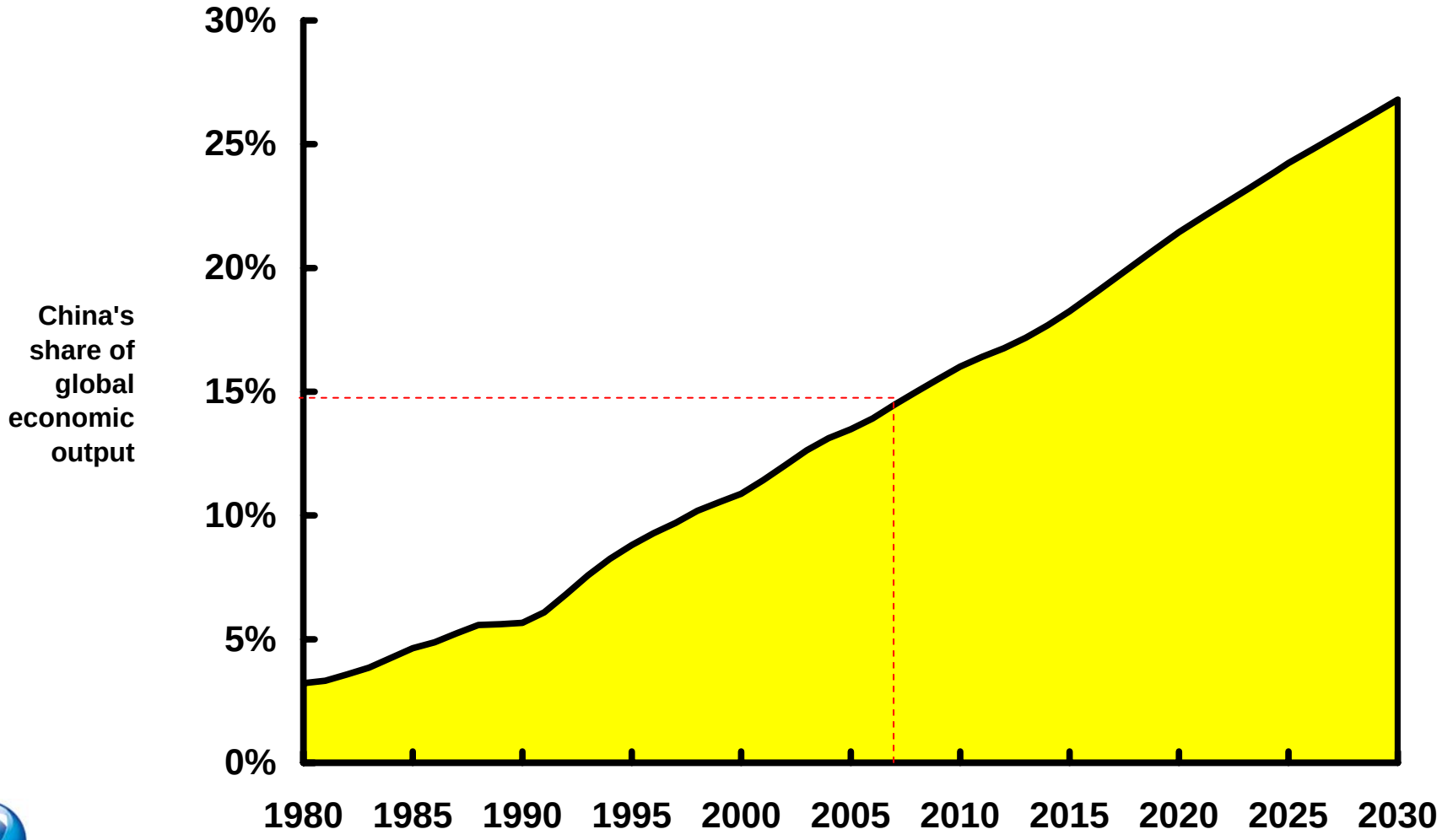
China's Share of the Global Economy

Half way to 2030…



Source: Projections from Cambridge Energy Research Associates. Historical data from the International Monetary Fund.

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Question 1: Global Energy Mix?

How does the global energy mix change over the period to 2030 in each scenario?

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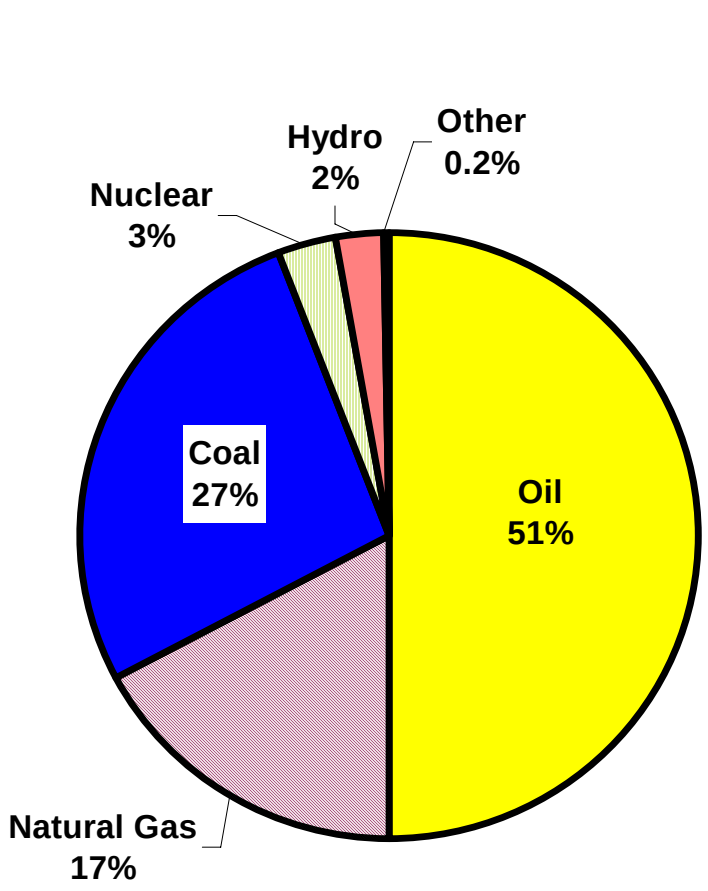
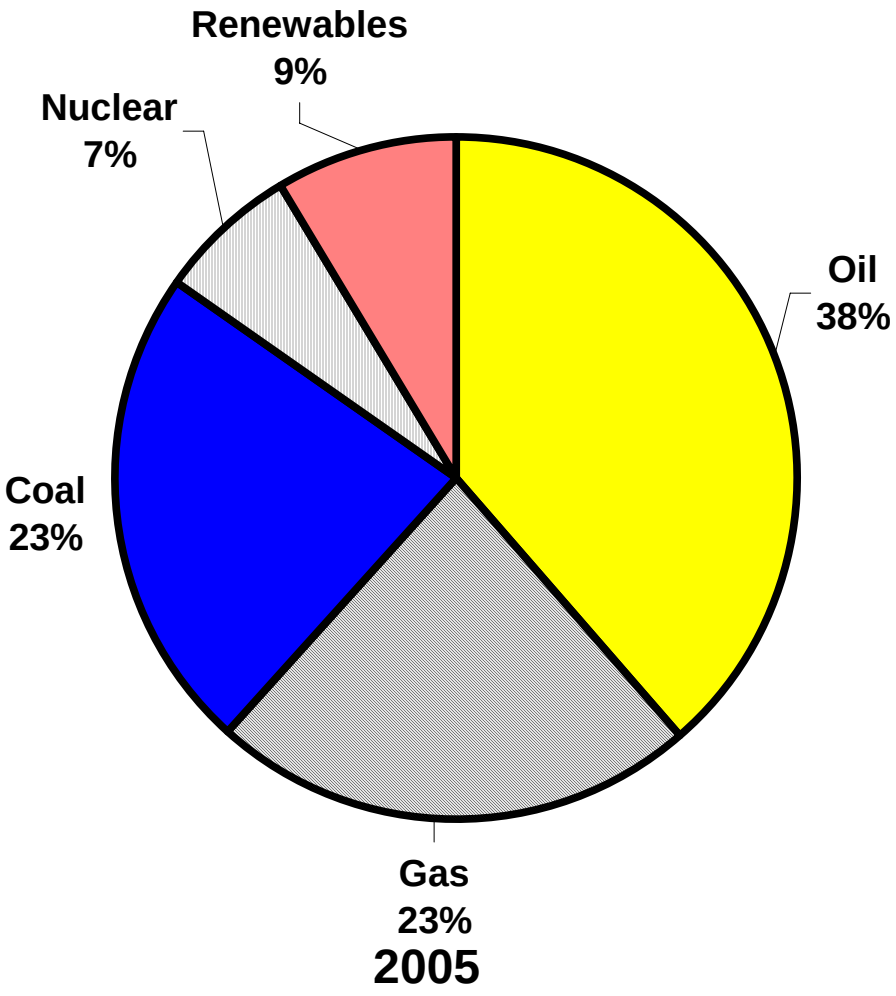
Historical Shares of Primary Energy Demand

Total primary energy demand roughly 60 percent higher in 2005 than in 1980



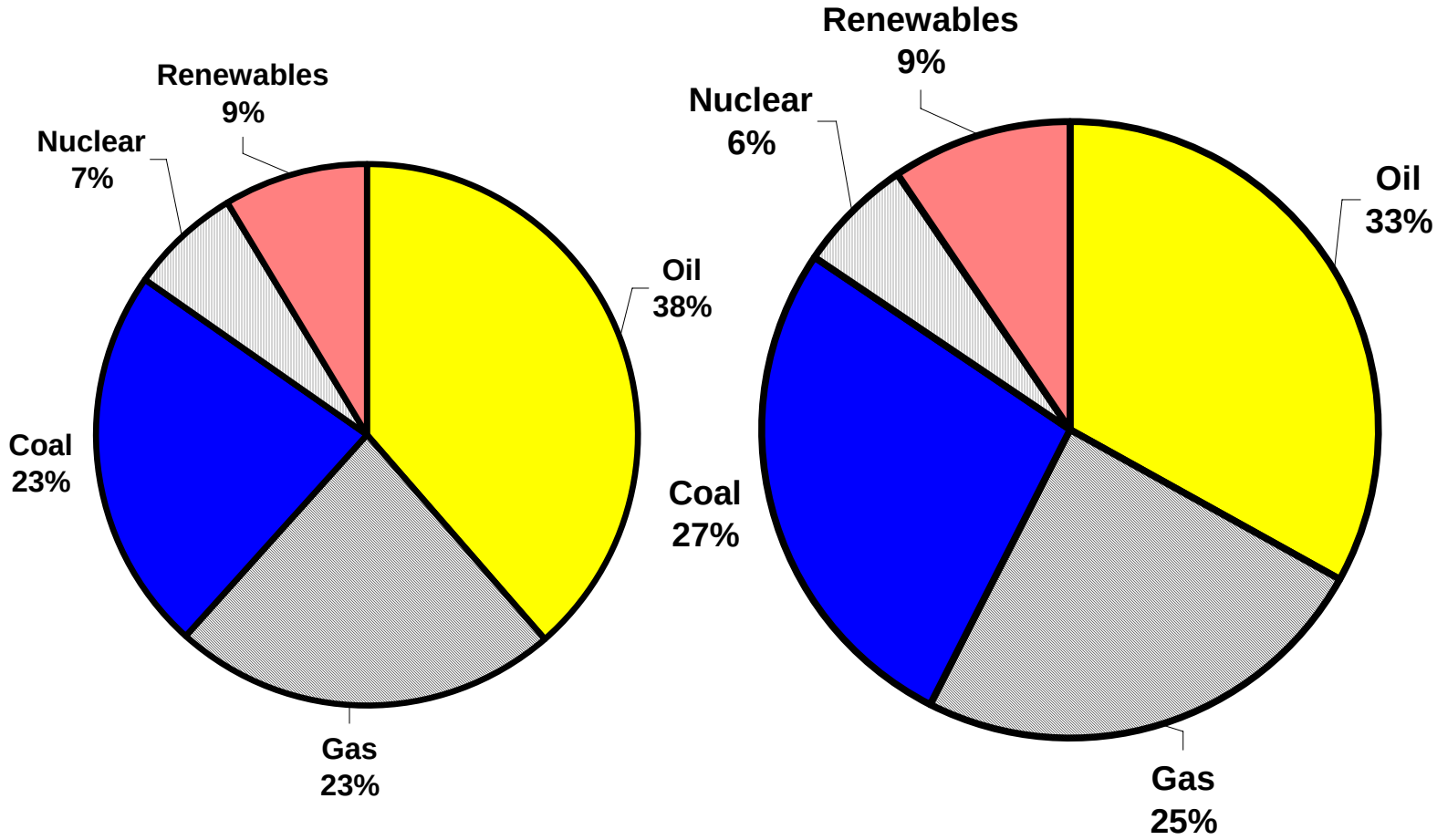


Source: International Energy Agency and Cambridge Energy Research Associates.
Note: Pies not drawn to relative scale.

ASIAN PHOENIX

Shares of Primary Energy Demand by Fuel

Total primary energy demand roughly 75 percent higher in 2030 than in 2005



Source: Cambridge Energy Research Associates.

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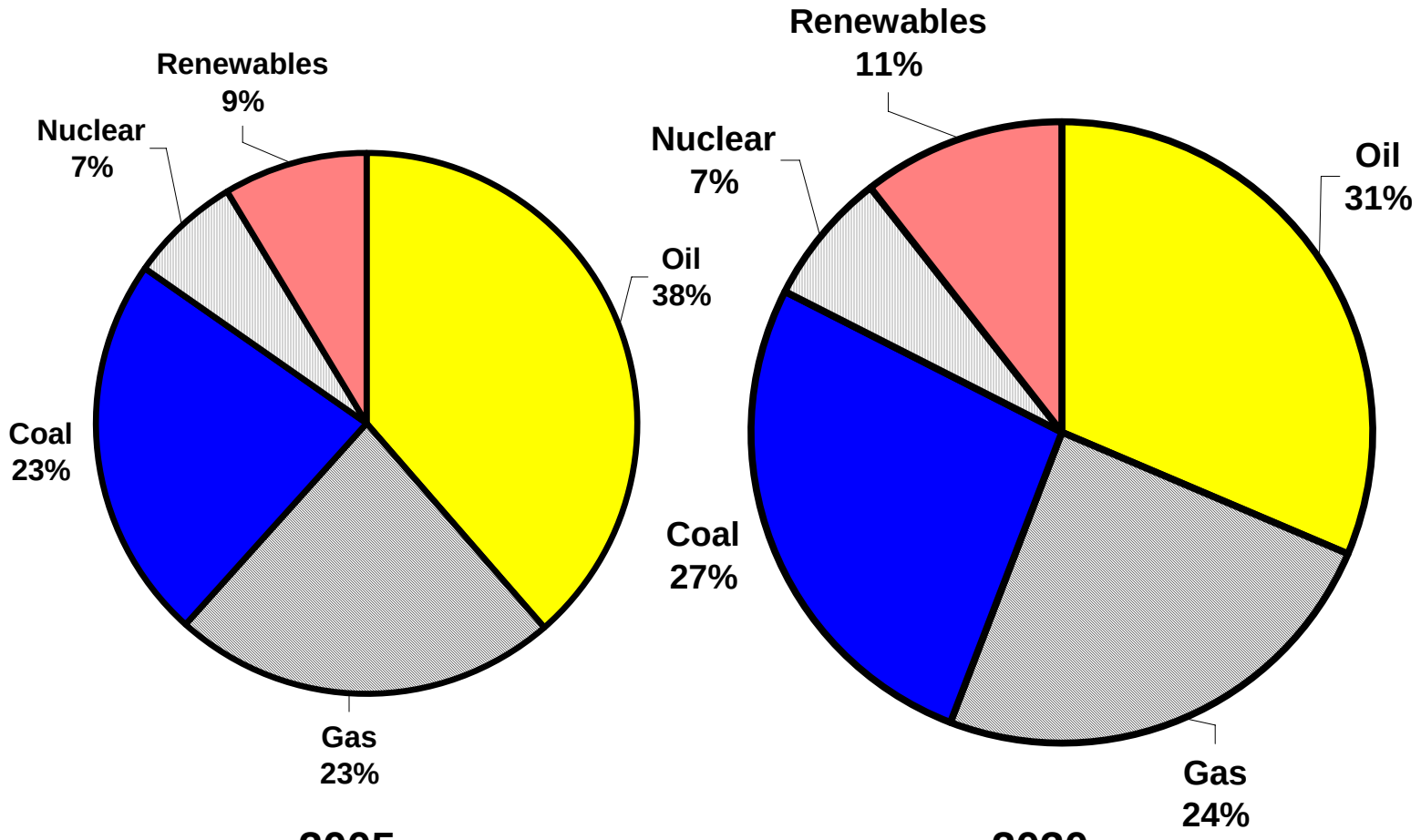
BREAK POINT

Shares of Primary Energy Demand by Fuel

Total primary energy demand roughly 60 percent higher in 2030 than in 2005



Source: Projections from Cambridge Energy Research Associates.

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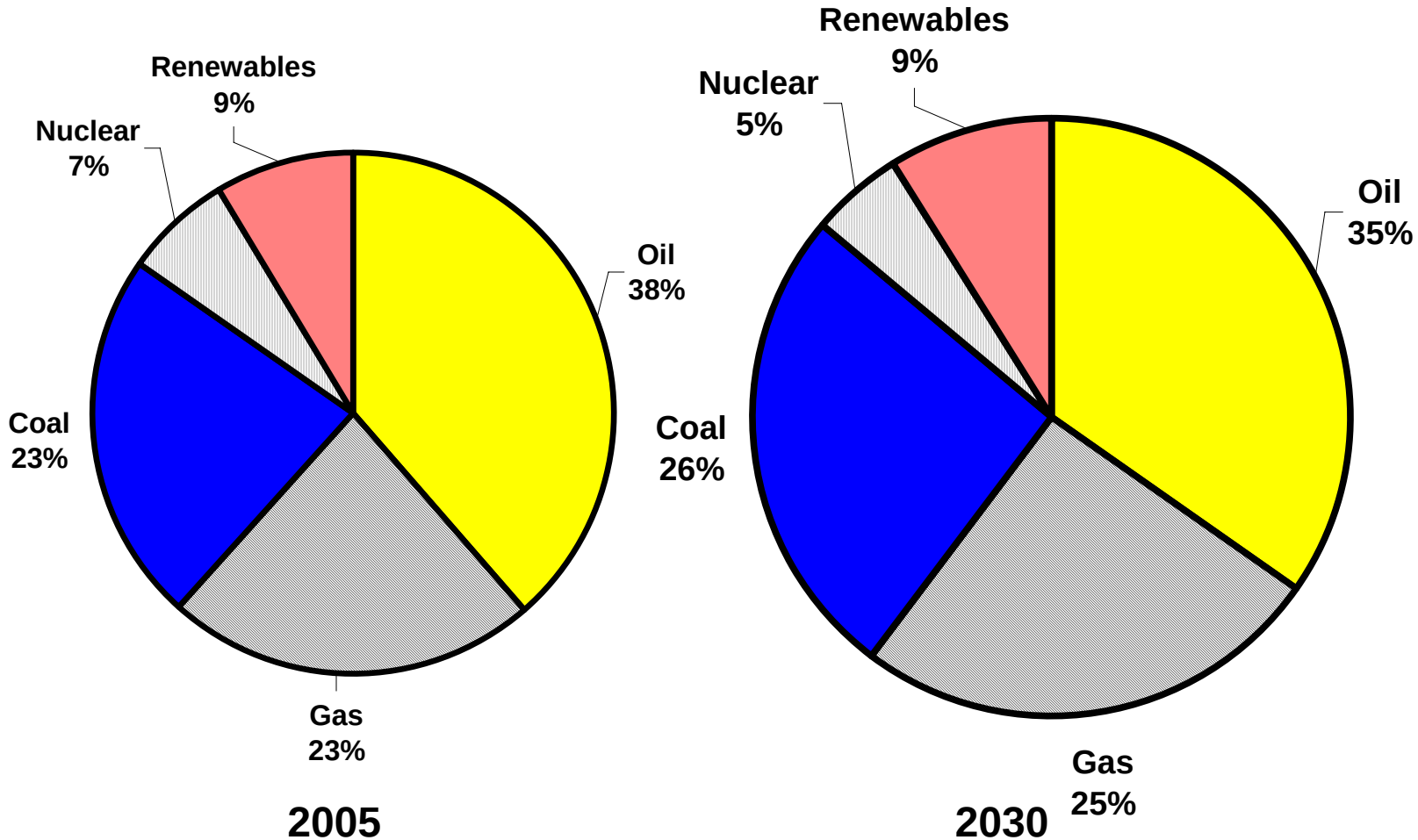
GLOBAL FISSURES

Shares of Primary Energy Demand by Fuel

Total primary energy demand roughly 50 percent higher in 2030 than in 2005



Source: Projections from Cambridge Energy Research Associates.

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Question 2: What about oil prices?

What happens to oil prices and demand in China over the period to 2030 in each scenario?

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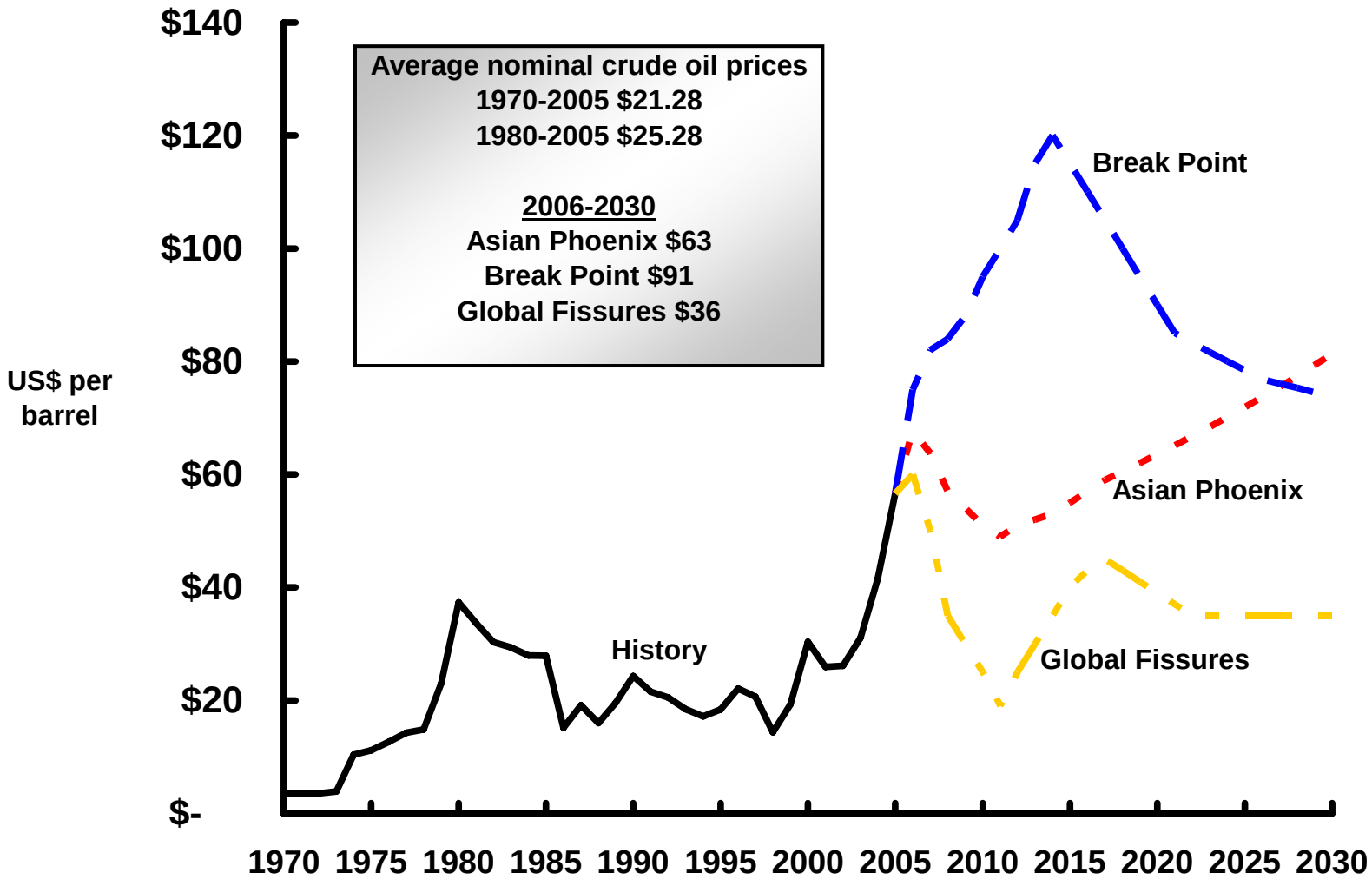
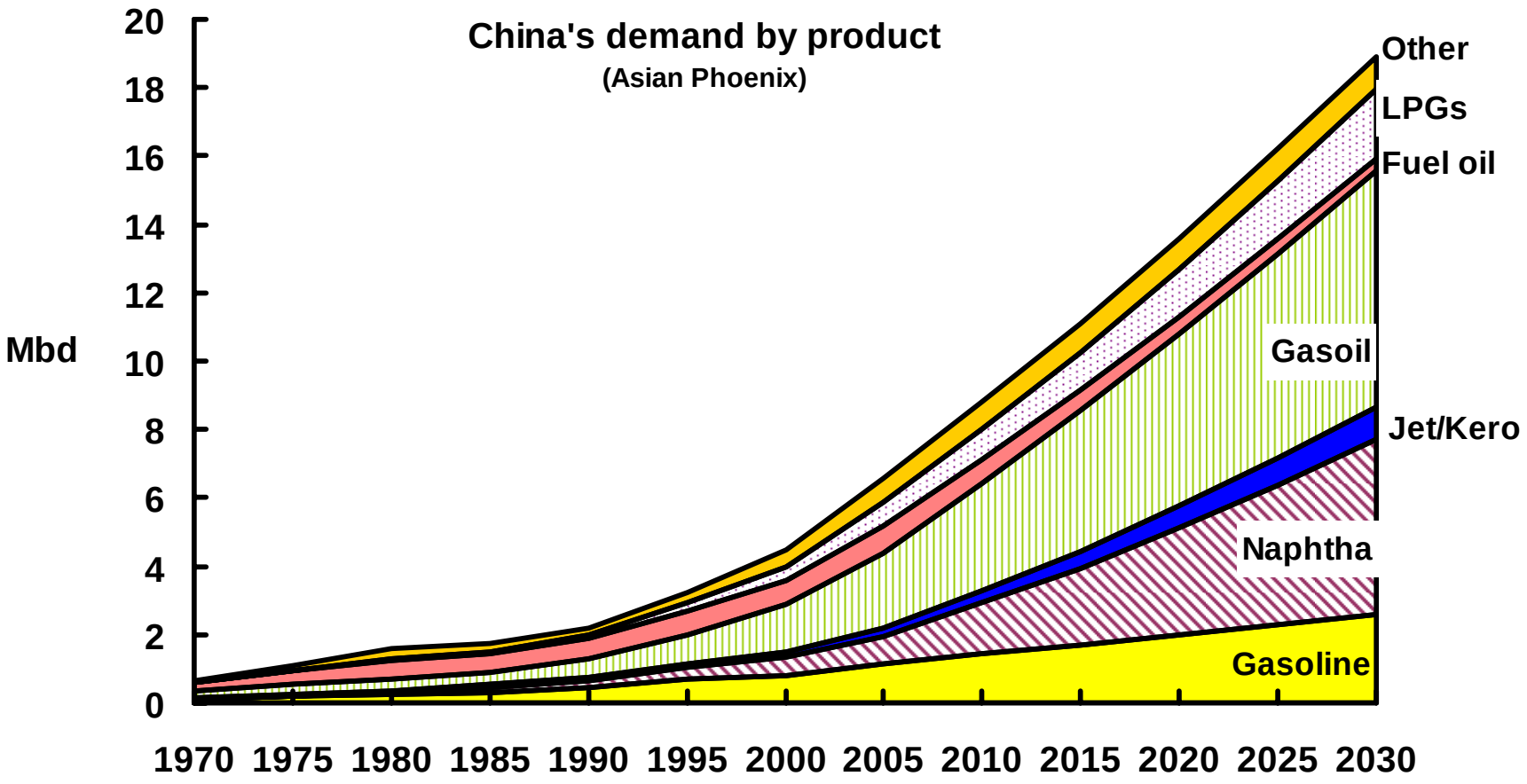
Nominal Prices to 2030 for Light Sweet Crude Oil



Source: Cambridge Energy Research Associates. Note: Prices are for light sweet crude oil delivered at Cushing, Oklahoma.

ASIAN PHOENIX

Chinese Oil Demand Increases from 6.6 mbd in 2005 to 18.8 mbd in 2030



Source: Cambridge Energy Research Associates.

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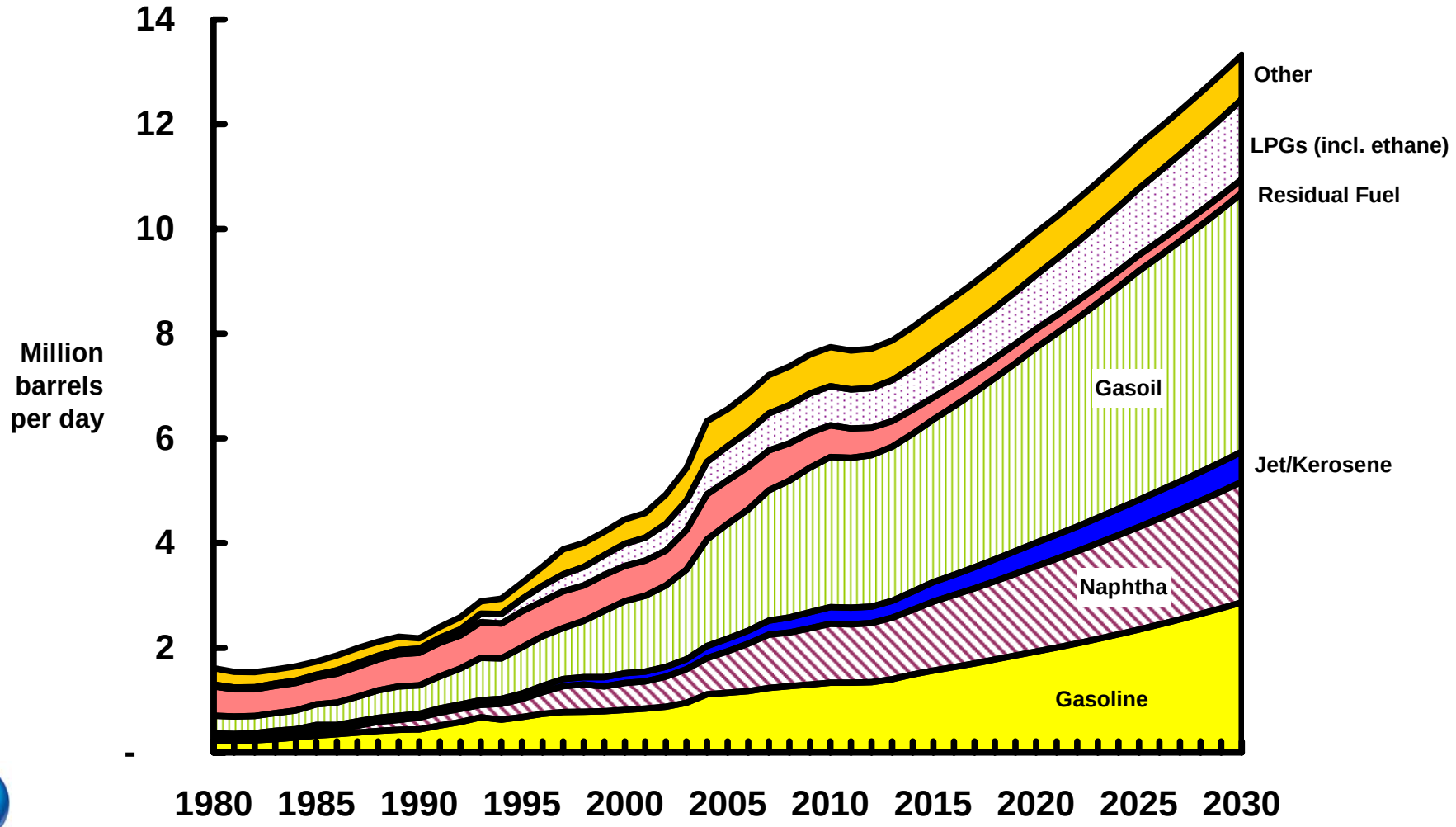
BREAK POINT

China's Oil Demand Increases from 6.6 mbd in 2005 to 13.3 mbd in 2030



Source: Cambridge Energy Research Associates.

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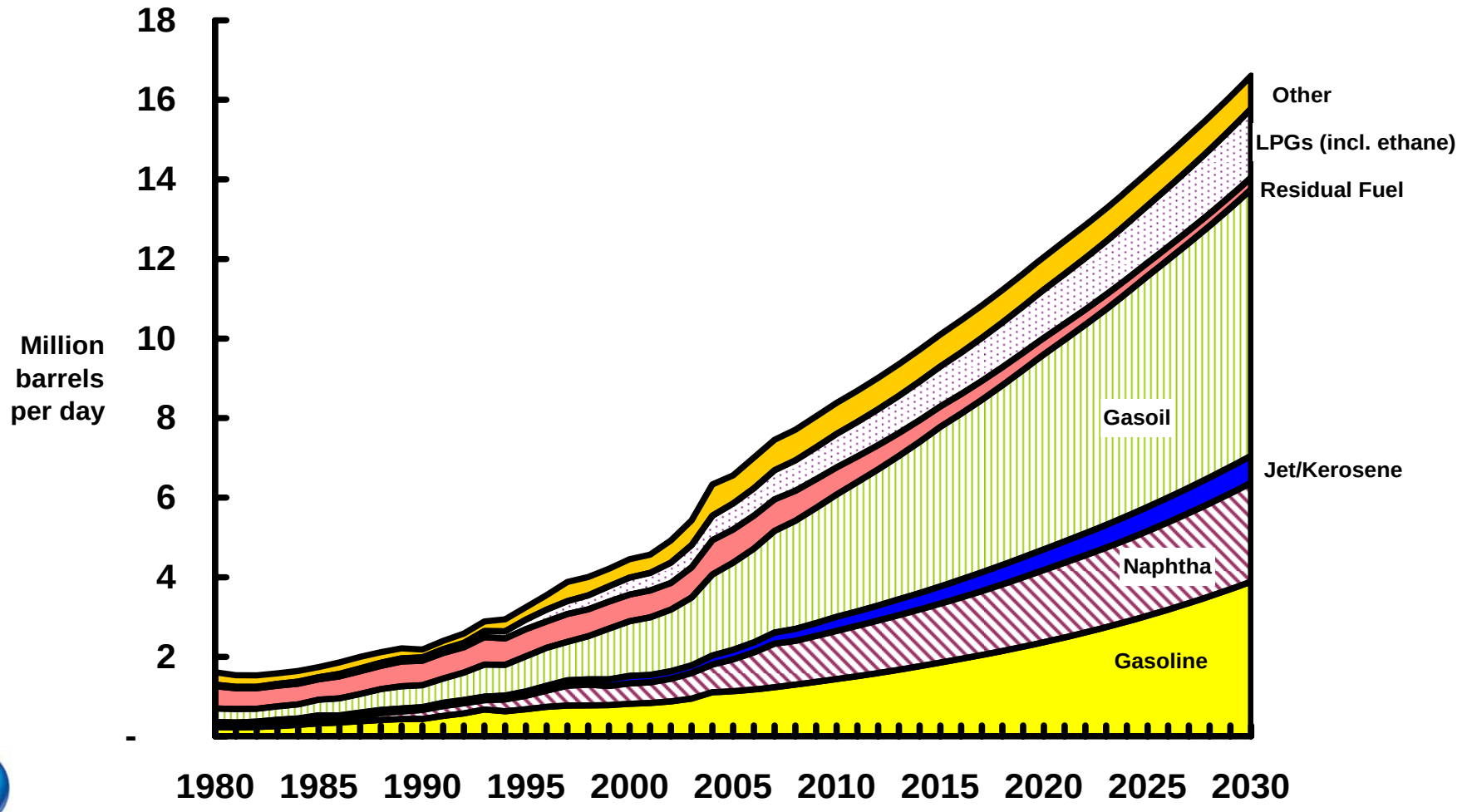
GLOBAL FISSURES

China's Oil Demand Increases from 6.6 mbd in 2005 to 16.6 mbd



Source: Cambridge Energy Research Associates.

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Question 3: The Power Mix?

How does the Power Generation Mix in China change over the period to 2030 in each scenario?

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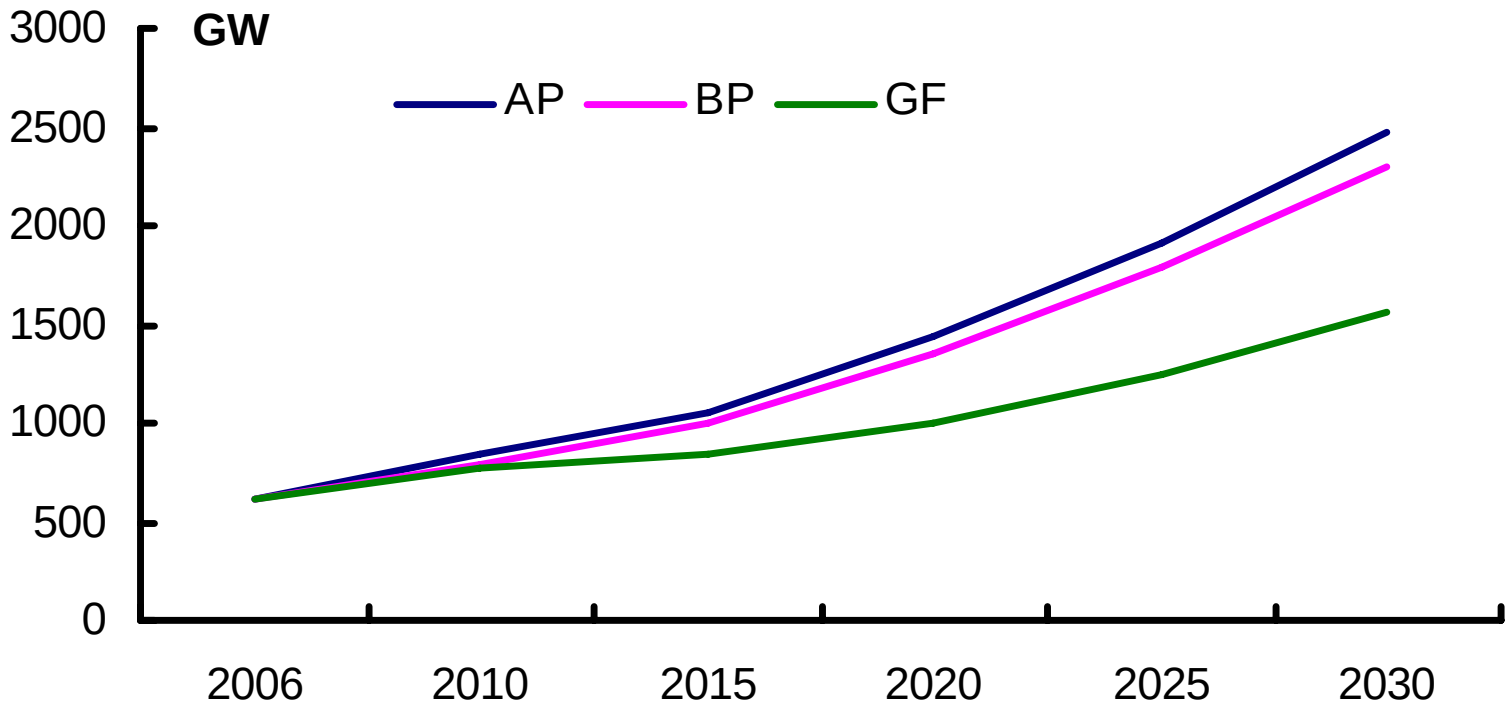
China Power supply growth for three scenarios



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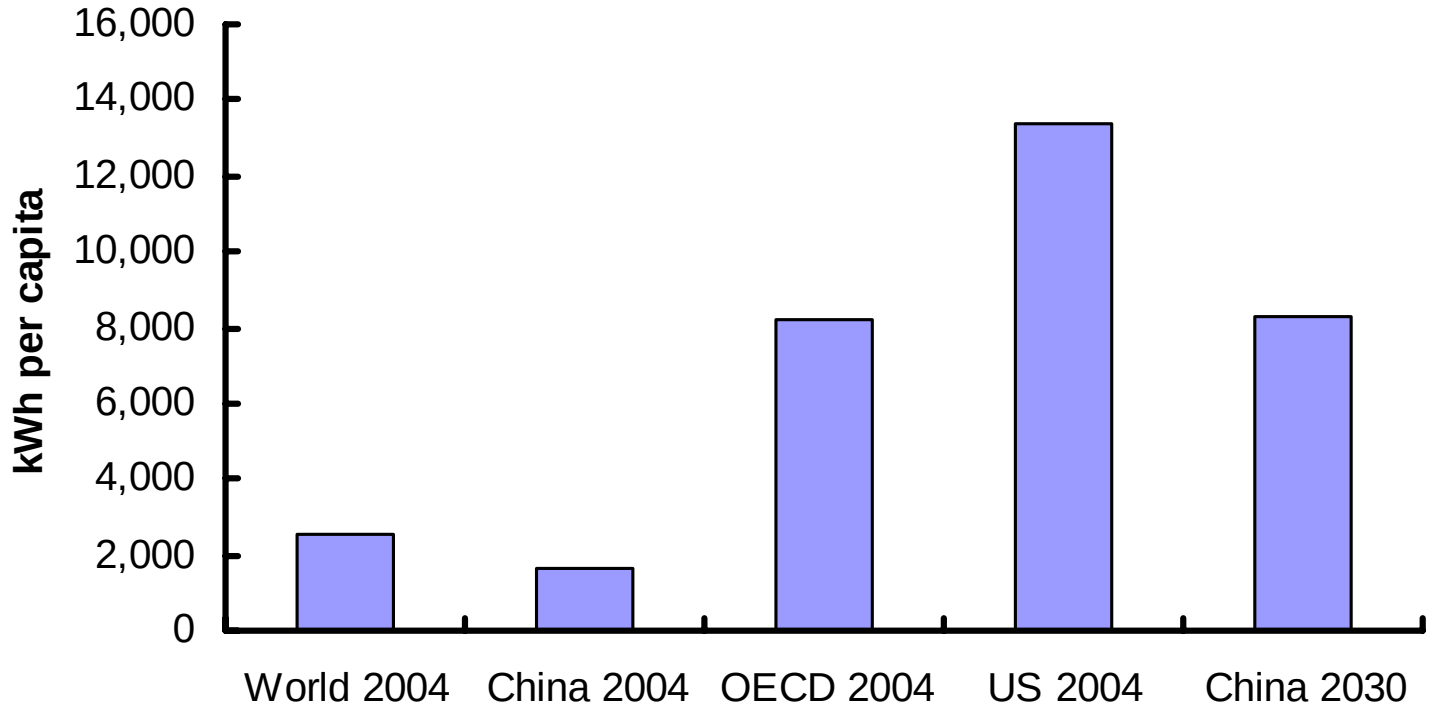
Electricity consumption per capita, kWh



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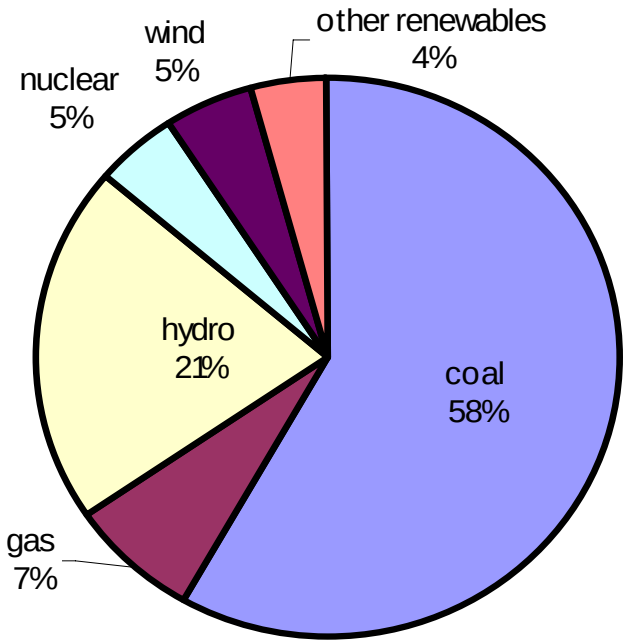
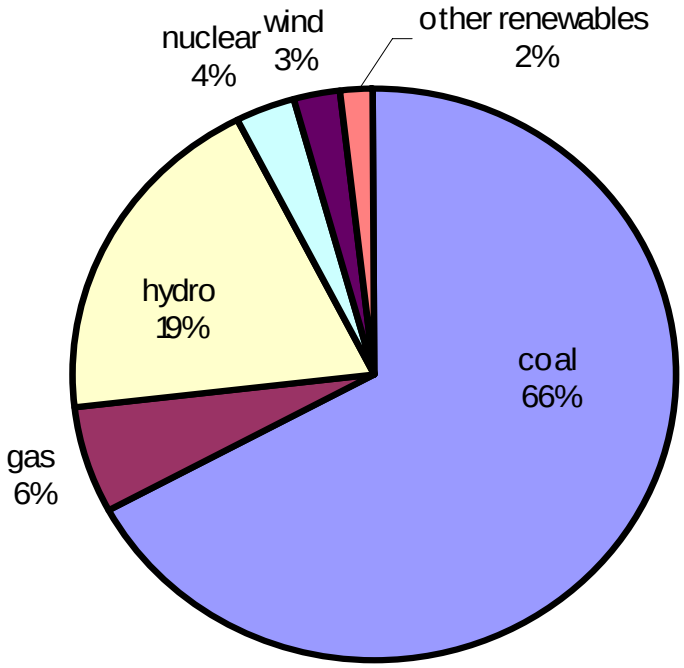
2030 Power Scenarios

Break Point



Global Fissure



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Power Scenarios

1. We haven't seen anything like this yet
   - Installed capacity increased by 450 GW in 25 years (1981-2005)
   - It may increase by as much as 2000 GW in the next 25 years (2006-2030)
   - Per capita power consumption reaches OECD's 2004 level

2. Fossil fuels, esp. coal will continue to be the dominant fuels
   - Coal capacity triple in size
   - 100 new nuclear reactors
   - All hydro resources (500 GW) exploited
   - Significant energy and environmental impacts

3. Great need for capital, technology and creative ways to mitigate environmental pollution

Source: Cambridge Energy Research Associates.

Question 4: CO2 Implications?

How do CO2 emissions develop over the period to 2030 in each scenario?

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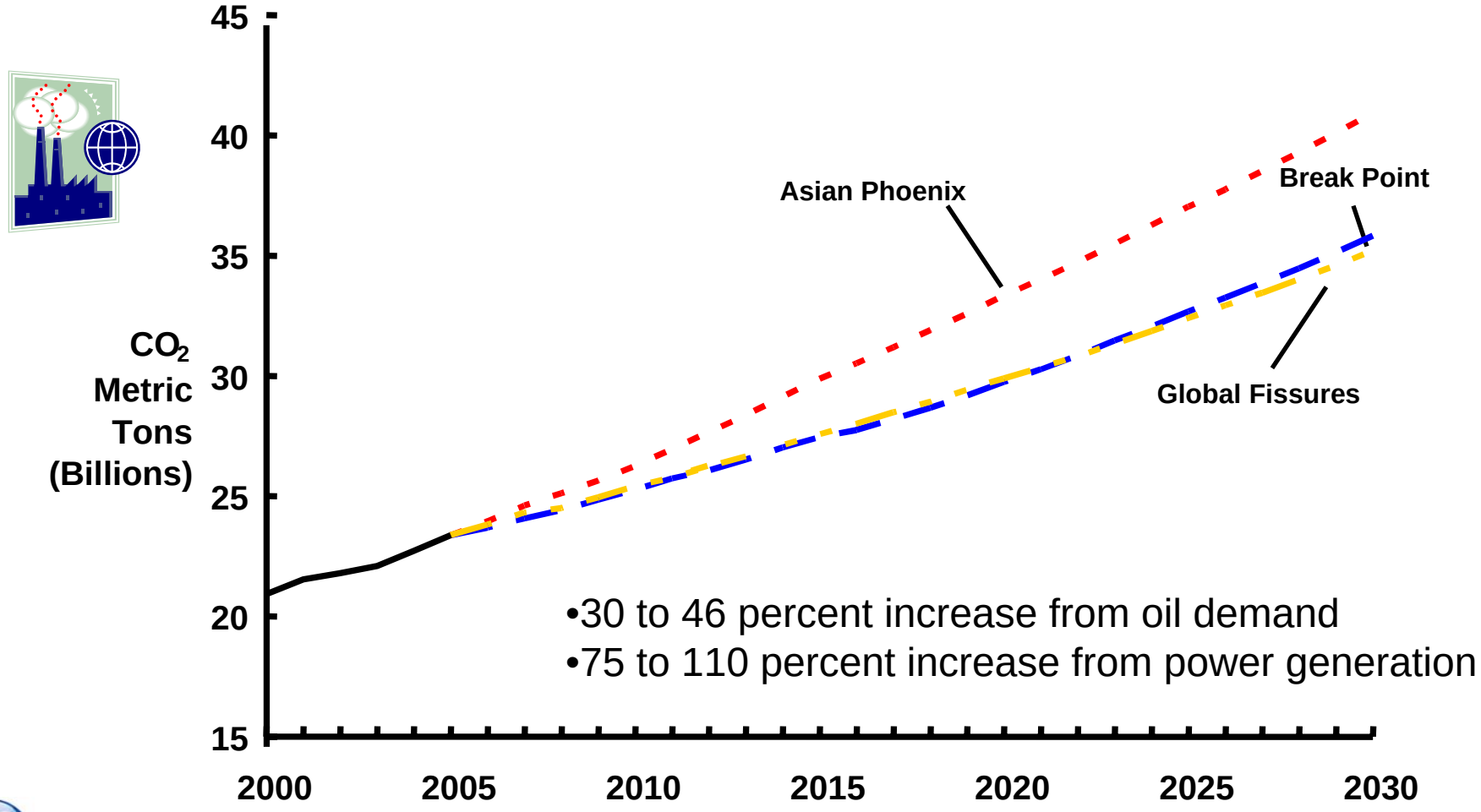
Global CO2 emissions rise significantly across all scenarios



Source: Cambridge Energy Research Associates.

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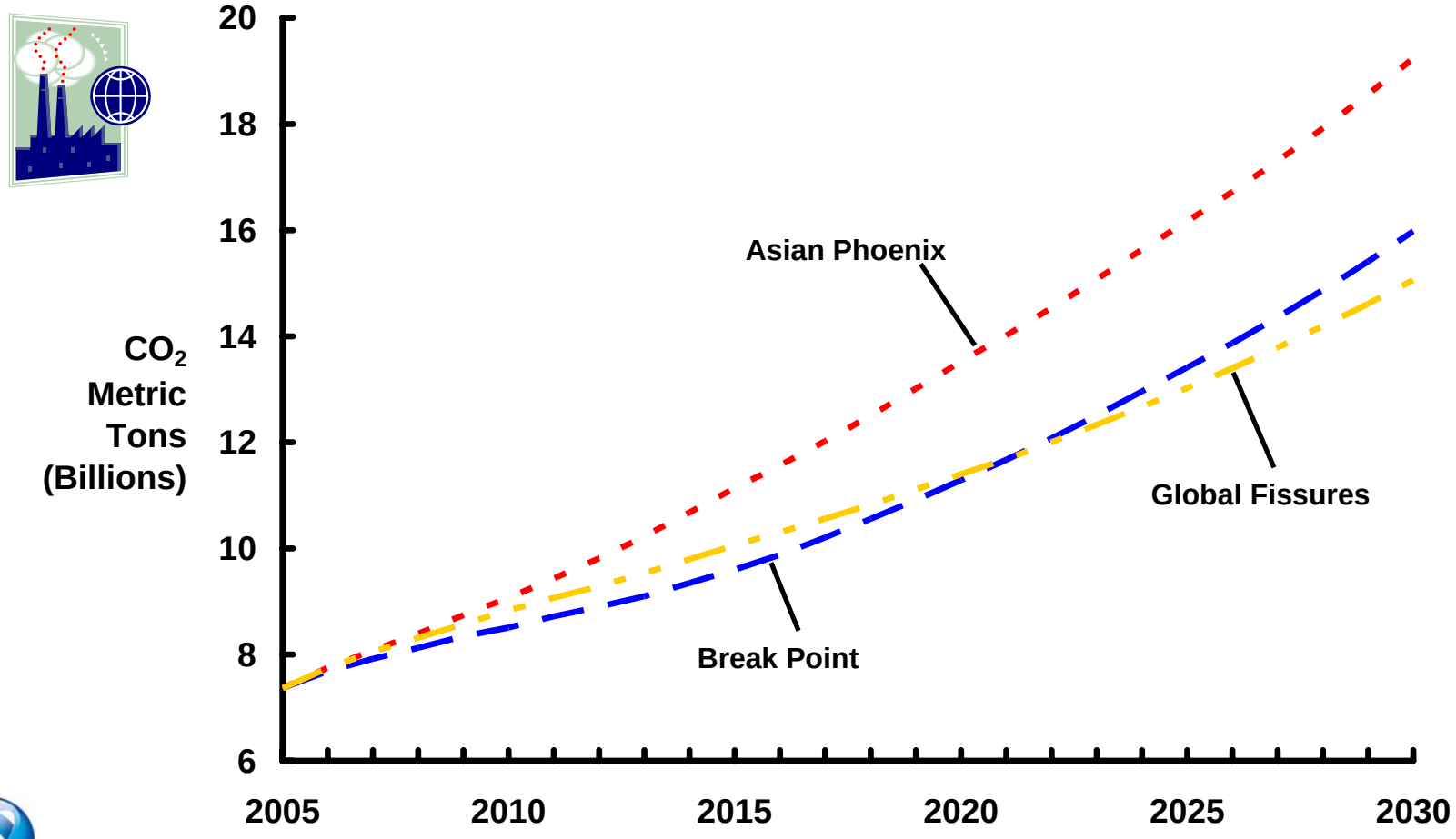
Asian CO_2 Emissions: All Energy Use



Source: Cambridge Energy Research Associates.

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Conclusions...

0. The Chinese economy will become a dominant force in Asia by 2030 and a major force in the world economy.

1. Primary energy supply grows by 50-75% over the period to 2030 but there are only modest changes in the fuel mix.

2. Even the highest oil prices do not have the impact of the price shocks of the 1970's. Primary supply risk is above ground.

3. We have not seen anything like the growth that will be required to meet electric power needs to 2030.

4. In every scenario, CO2 emissions increase dramatically – is this acceptable?

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