

Chinese Economic Development and Implications for World Wide Energy Demand

Outline

- Role of energy in macroeconomics
- Energy industries
- Historical development and energy consumption trends
- Forecasting energy demand
- Energy demand in China past, present and future
- Implications of Chinese energy demand trends



“Every day the world needs more energy”



Energy and Macroeconomics



Energy and Macroeconomics

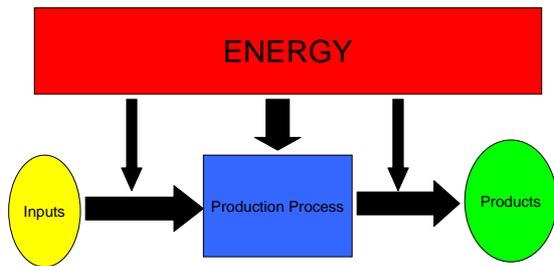
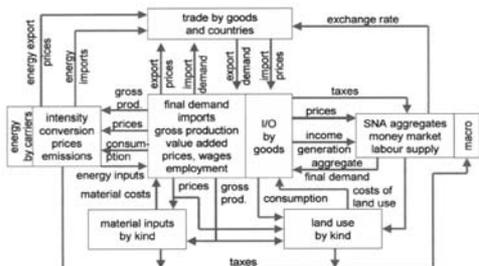


Figure 3 Model structure for a specific country



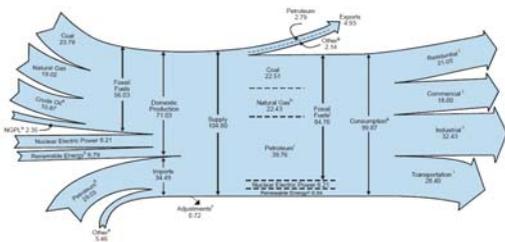
Source: Meyer B., Lutz C., and Wolter, M. 2004. *Economic Growth of EU and Asia. A First Forecast with the Global Econometric Model GINFORS*. Policy and Governance Working Paper Series No. 26

Energy Related Markets

- Petroleum and Other Liquid Fuels
- Natural Gas
- Coal
- Electricity
- Renewable/Alternative Resources
- Carbon Emissions
- Environmental Externalities

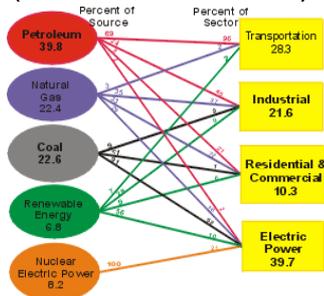
Energy Flow in U.S.

Diagram 1. Energy Flow, 2006
(Quadrillion Btu)



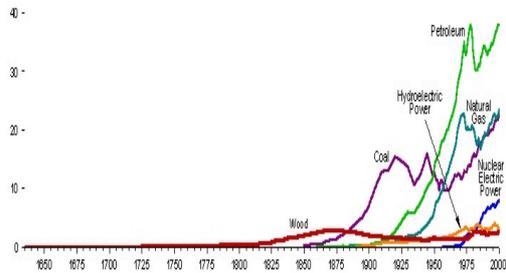
Source: Energy Information Administration, *Annual Report 2006*

U.S. Energy Consumption By Sector (Quadrillion of Btus)



Source: Energy Information Administration, *Annual Energy Review 2006*

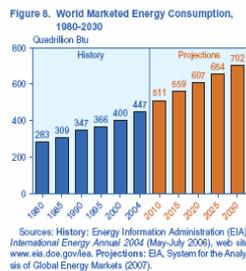
Historical U.S. Energy Use By Sector (Quadrillions of Btus)



Source: Energy Information Administration/Annual Report 2001

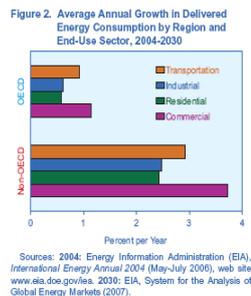
Total World Marketed Energy Consumption

- Projected to increase by 57% from 2004
- For non-OECD countries projected demand growth is 95% → linked directly to forecasted high economic growth



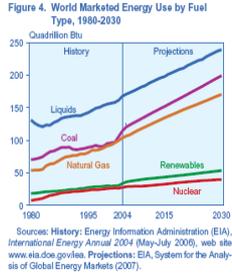
Projected Delivered Energy Consumption by Sector

- Energy use in transportation historically linked to per capita income
- Transportation energy use requires extensive infrastructure
- OECD energy markets are well-developed and have slower growth across all sector



Projected World Marketed Energy Use by Fuel Type

- Liquid fuel use declines in most sectors except transportation
- Natural gas demand (and price) rises as a substitute for liquid fuels
- Coal becomes a more cost-competitive, experiences rapid growth in demand
- China's industrial sector is projected to account for 78% of increase in worldwide coal use



Coal Consumption

Figure 12. World Coal Consumption by Region, 2004-2030

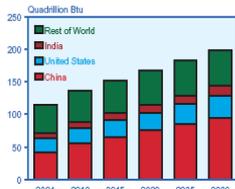
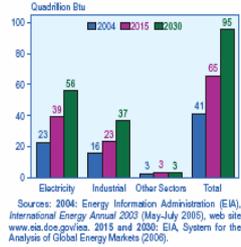


Figure 58. Coal Consumption in China by Sector, 2004, 2015, and 2030

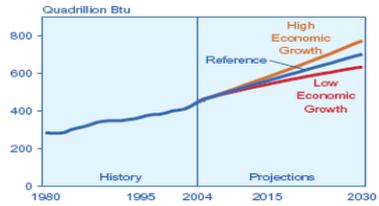


Challenges in Forecasting

- International Energy Outlook, 2007 forecasts:
 - High and low macroeconomic growth models
 - High and low price world oil prices models
- International Energy Outlook, 2007 recognizes other possible uncertainties:
 - Technology change
 - Ratio of energy consumption to GDP (energy intensity) changes
 - Policy decisions

Impacts of Macroeconomic Growth

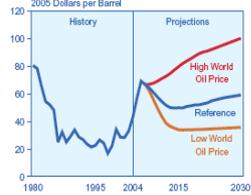
Figure 16. World Marketed Energy Consumption in Three Economic Growth Cases, 1980-2030



Sources: History: Energy Information Administration (EIA), *International Energy Annual 2004* (May-July 2006), web site www.eia.doe.gov/iea. Projections: EIA, *System for the Analysis of Global Energy Markets* (2007).

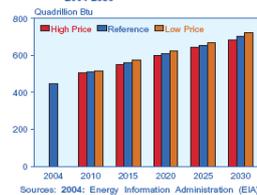
Impact of Oil Prices on Forecasts

Figure 17. World Oil Prices in Three World Oil Price Cases, 1980-2030



Source: Energy Information Administration (EIA), *Annual Energy Outlook 2007*, DOE/EIA-0383(2007) (Washington, DC, February 2007), web site www.eia.doe.gov/oi/afo.

Figure 18. World Marketed Energy Consumption in Three World Oil Price Cases, 2004-2030

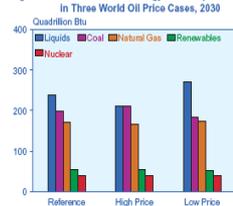


Sources: 2004: Energy Information Administration (EIA), *International Energy Annual 2004* (May-July 2006), web site www.eia.doe.gov/iea. Projections: EIA, *System for the Analysis of Global Energy Markets* (2007).

Impact of Oil Prices on Forecasts

- Oil prices impact national domestic economic activity and import/export activity
- Oil prices fluctuations change allocation of production resources
- Oil prices are related to unstable conditions like weather and politics

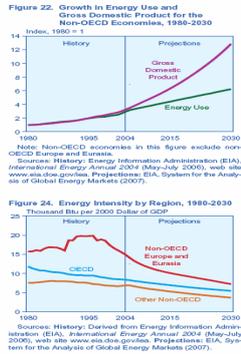
Figure 19. World Marketed Energy Consumption in Three World Oil Price Cases, 2030



Note: Liquids supply sources include both conventional and unconventional sources.
Source: Energy Information Administration, *System for the Analysis of Global Energy Markets* (2007).

Trends in Energy Intensity

- Economic growth has recently begun to outpace growth in energy use
- Strongly linked to standard of living
- Fast growth in income → fast improvements in energy intensity



China's 11th Five Year Plan

- Lists “significant improvement of resource utilization efficiency” and “strengthened capacity of sustainable development” as development goals
- Target of 20% reduction in energy consumption per GDP in 5 years

China's Priority Programs of Energy Conservation

- Upgrading of low-efficiency coal-fired industrial boiler
- District heat and power cogeneration
- Recovery of residual heat and pressure
- Oil saving and substitution
- Energy conservation of motor system
- Optimization of energy system

China's Priority Programs of Energy Conservation

- Energy conservation in buildings
- Green lighting
- Energy conservation in government agencies
- Building the energy conservation monitoring and technological support system

China's Transportation Targets 2006-2010

- Six new railways
- 14 expressways
- Transit system for transportation of coal and imported gas, gas and iron ore, and containers transport systems at 12 seaports
- Acceleration of port construction along inland rivers
- Expansion of 10 airports, relocation of 2 airports, Airport development in central, western, and northeastern China

China's Energy Demand Growth

- EIA forecasts that China will account:
 - 78% of world wide increase in demand for coal between 2004-2030
 - 38% of world wide increase in demand for oil in 2006
- Between 2000-2006 electricity consumption and generation grew by 60%

Economic Factors of China's Energy Demand

- Sector Organization:
 - Exploration and production
 - Distribution Infrastructure
 - Downstream Refining
- Determinant of Demand
- Determinants of Supply
- International Relations

Implications of China's Energy Needs

- Development of important geopolitical relationships to continue to meet rising demand
- Emphasize technological development both in all areas of energy industries: production and exploration, transportation, downstream refining
- Emphasize technological development of other economic sectors
- Develop relationships with foreign investors to build technology
- World wide environmental impacts
- Influence world wide economy through large share in energy demand
