Energy Efficiency in China: Glorious History, Uncertain Future

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On the Occasion of the Commemoration of Art’s Career and the Rosenfeld Effect

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Part I: Glorious History
preceded in good dialectical fashion by an inglorious earlier history

Part II: Energy Crisis in China: 2001 to present
repeat of much earlier “inglorious history”??

Part III: The Future:
What might happen? What is to be done to end the crisis?

Addendum on Oil
Executive Summary (Part I)

• Things were bad in energy (for 3 decades)
• Deng Xiaoping came to power
  — A group of academics suggested a new approach to energy
  — Deng listened!
• Things were much better (for 2 decades)
• The market became king
  — Energy went off track again
• There are solutions
  — The Chinese government and Communist party are responding, somewhat in the manner of Deng
Part I: three phases

• Phase I

• Phase II
  Deng’s Initial Reforms (1981-1992)

• Phase III
  Transition Period (1993 to 2001)

- Single objective was rapid energy supply growth
- Energy prices greatly subsidized
- Central allocation system provided energy primarily to industry
- No attention to environment
- **Result:** one of the world’s least efficient (and fastest growing) energy systems

Source: NBS
Phase II: Deng’s Initial Reforms (1981-1992)

• Key meeting among more than 100 non-governmental energy experts in 1980 stated:
  — China energy policy in crisis
  — need for radical reform
  — major changes identified:
    (1) energy price reform, and
    (2) serious attention to energy efficiency

• Government quickly implemented reforms in Sixth Five-Year Plan (1981-1985)

Source: NBS
Energy-conservation policies & measures in Phase II

• Energy Management
  — factory energy consumption quotas
  — factory energy conservation monitoring
  — efficient technology promotion
  — close inefficient facilities
  — controls on oil use

• Financial Incentives
  — low interest rates for efficiency project loans
  — reduced taxes on efficient product purchases
  — incentives to develop new efficient products
  — monetary awards to efficient enterprises

• R D & D
  — funded strategic technology development
  — funded demonstration projects

• Information Services
  — national information network
  — national, local, and sectoral efficiency technical service centers

• Education & Training
  — national, local, and sectoral efficiency training centers
  — Energy Conservation Week
  — school curricula
Investment in energy efficiency and other policies greatly reduced China’s energy intensity (1980-2000)


Source: NBS
Energy efficiency investment is stable, but declining as share of total investment.
China’s CO$_2$ emissions would have surpassed the US if energy intensity had not declined.

**Carbon Dioxide Emission Estimates:**

- **USA**
- **China**
- **Former Soviet Union**
- **Japan**
- **India**

Source: ORNL
Phase III: Transition Period (1993 to 2001)

Rapid movement towards market-based system...

—Dramatic energy price reforms
  • coal prices deregulated
  • higher oil prices (approach international levels)
  • sharp rises in electricity prices
—Enterprise reforms increased price sensitivity

…but past successes in improving energy efficiency were based on mechanisms now gone or disappearing...

—Elimination of energy quotas lessened incentives for monitoring
—Difficulty in continuing energy efficiency loan subsidies
—New tax code (1994) eliminated tax breaks for efficiency

…thus many challenges remain.
Take-off of consumer goods highlights the need for efficiency standards

Production of Consumer Durables, 1980-1999

Source: NBS
Part II: Energy Crisis in China: 2001 to present
repeat of much earlier “inglorious history”??
Executive Summary (Part II)

• China faces a serious **new energy crisis**
  — Most Chinese see the **energy shortage** as the crisis
  — The real crisis is in **energy policy** (just as in 1979)

• The key issues: how can **investment** be attracted to energy efficiency and how can **government policy** spur such investment?

• Unless this problem is solved, it is unlikely that China will achieve its economic goals for 2020
  — The **environmental consequences** of energy policy failure are truly frightening
  — Rapid energy growth portends **economic consequences** of equal concern
Current Energy Crisis

- Energy demand growing very, very fast
- In 2004, widespread power shortage (24 of 31 provinces)
- Soaring coal prices
- Transportation bottlenecks for coal
- Significant economic losses
- “Surge” in oil imports especially as oil is used in place of coal
China has demonstrated that a rapidly developing nation can decouple energy and GDP growth with bold policies initiated in 1980.
Since 2001, energy use has grown much faster than GDP, reversing patterns from 1980 to 2000

China’s Energy and Development
Goals for 2020

Goals (compared with 2000)
• GDP -- Quadrupling
• Urbanization -- 65% vs 35% now
• Energy Use -- Doubling

But energy demand is now growing so rapidly that the development goals are in jeopardy!
Another view of the data

Source: NBS, China Statistical Yearbook, various years; China Statistical Abstract 2005; growth estimates extrapolated from mid-year production data for 2005; targets announced by NDRC.
China’s Response: Fast and Furious

Boom in power plant construction
  — 50-70 GW added each year!!
  — Mostly coal-fired
Growth in heavy has been extraordinary in past five years: industrial efficiency especially critical

- Consumes >60% of energy
- Technical complexity: many different types of processes
- Extraordinary growth in past five years
- Existence of many old, legacy industrial facilities
Cement Production Worldwide: 2004

United States 5% (includes Puerto Rico)

India 6%

China 44%

Rest of World 32%

Italy 2%
Brazil 2%
Spain 2%
Russia 2%
South Korea 2%
Japan 3%

China is the world leader in the production of many industrial commodities.
Part III: The Future

What might happen? What is to be done to end the crisis?
Executive Summary (Part III)

• Things could get worse
  — Actually they can’t, but they could continue on the present path for some time

• Things could get better
  — It now appears they will!!
China’s National Energy Strategy

“Energy development and efficiency have equal role (emphasis on efficiency)”

• But supply investment at RMB 424 billion ($50B) while energy conservation investment at RMB 23 billion ($3B) in 2003!!
Energy Investment

- Energy supply investment is ~18 times energy efficiency investment
- Energy efficiency investment needs to increase from $3B to $25B per year (avg over next decade)
China’s government now recognizes the urgency of energy efficiency

• The reform period (1980-2000) showed that energy efficiency was essential to achieve economic goals (Deng Xiaoping)

• The current leadership recognizes the same imperative (Plenary of the Communist Party, Nov, 2005)—Premier Wen Jiabao:
  “Energy use per unit of GDP must be reduced by 20% from 2005 to 2010”

• Statement reiterated by the National Peoples Congress (March 2006)
THE END
(almost)
Skills Only Found in China
Addendum on Oil