



## Energy Efficiency in China

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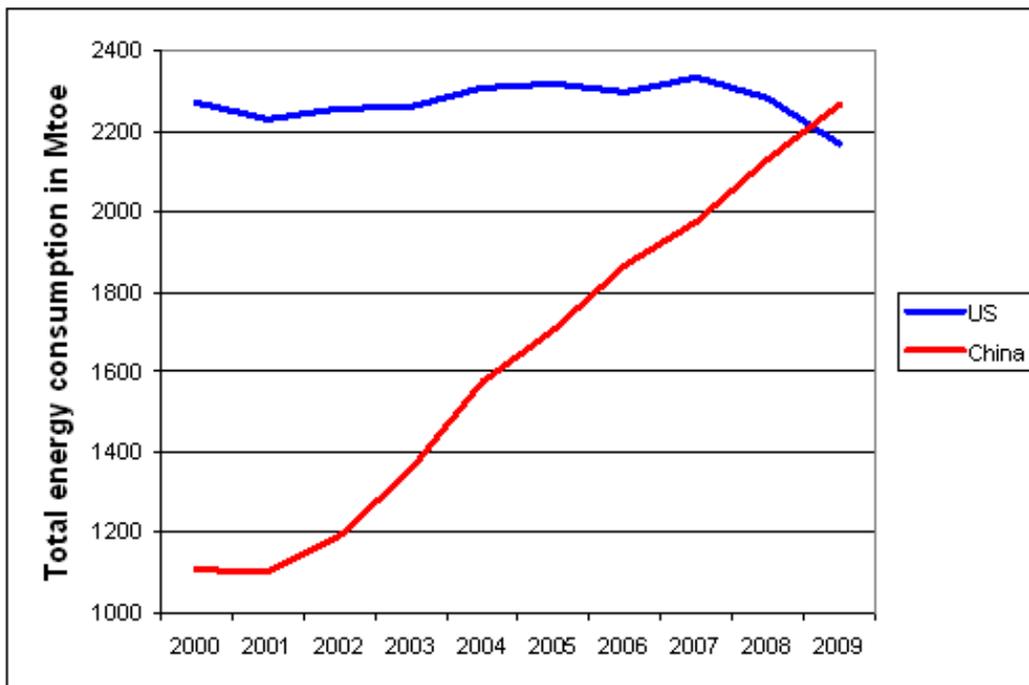
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David Crossley

When I say that I've been working in China since 2009 and the organisations I work with have been there since 1999, many people seem to have an irrepressible urge to tell me what they think is happening in the Middle Kingdom. Because most of these informants have never actually been to China, much of what they tell me is plain wrong.

One area about which there is much misinformation is China's performance on energy efficiency and consequently emissions mitigation. I'm often told that China is doing little about reducing its use of energy and consequently emissions are rising uncontrollably. As with most things about China, the actual situation is more complex.

True, China uses a huge amount of energy and both energy use and emissions are increasing rapidly. As the chart below shows, in 2009 energy use in China surpassed that of the United States.



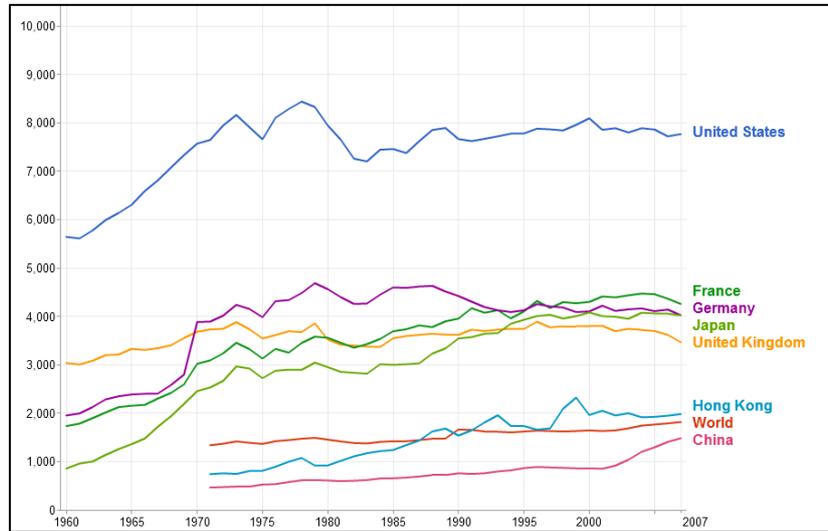
Energy

Use in China and the United States 2000 to 2009 (Mtoe)

Source: International Energy Agency



However, China has a lot more people than the US – 1.35 billion compared with 315 million – and China’s per capita energy use is well below the world average, though it has been increasing sharply since 2001, as shown in the following chart.



**Primary Energy Use Per Capita 1960 to 2007 (kgoe/capita)**

*Source: World Bank World Development Indicators*

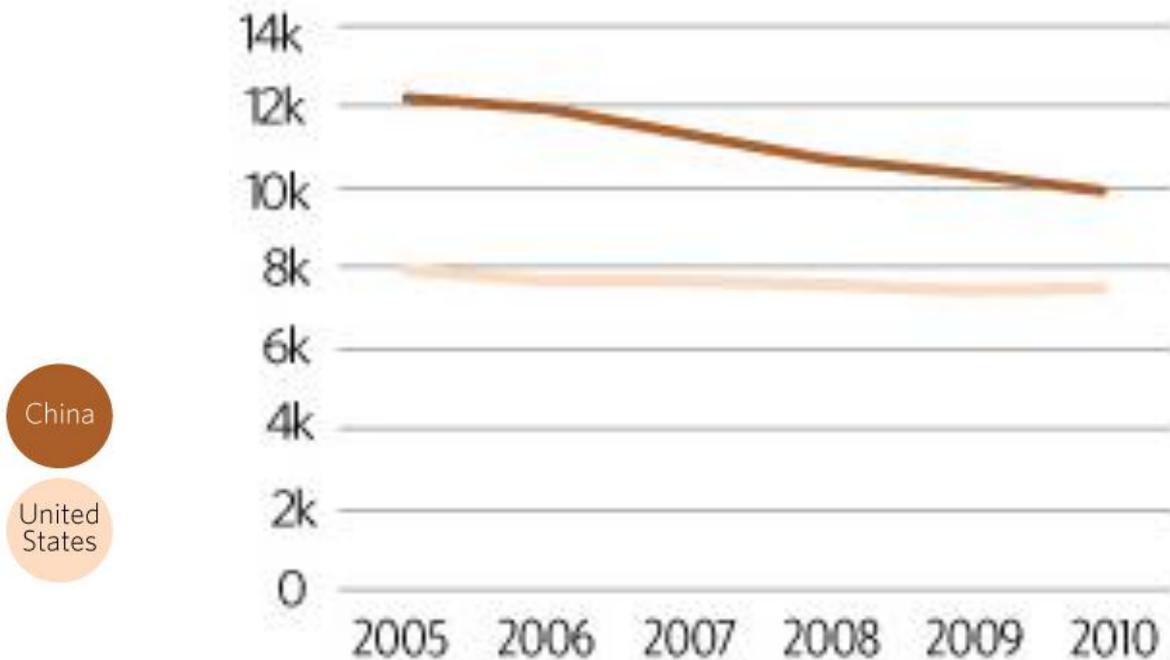
The most interesting story concerns what’s been happening with China’s energy intensity (energy use per unit of GDP). As shown in the following chart, energy intensity has been decreasing steadily since 1980, except for a short-term blip between 2002 and 2004. Though not shown on the chart, the decrease actually started in 1976.



**Energy Intensity in China 1980 to 2009 (Btu/GDP in 2005 US\$)**

*Source: US Energy Information Administration*

The following chart shows that energy intensity in China is still higher than in the United States but China is trending downwards, whereas the US is pretty static.



### Energy Intensity in China and the United States 2005 to 2010 (Btu/\$GDP)

Source: Climate Policy Institute / Tsinghua University

The major cause of the long-term and quite steep decline in energy intensity is the extensive, government-driven energy efficiency programs that have been implemented in China, about which little is known in the west.

### Development of Energy Conservation Policies

Chinese government involvement in energy efficiency commenced in the 1980s with the establishment of energy conservation agencies with managerial functions at various levels of government. Energy engineers and energy administrative bodies were also introduced into large- and medium-sized state-owned enterprises, and special personnel were assigned to manage energy conservation.

Over 200 Energy Conservation Centres were set up by local governments and sectoral agencies; their mission was to assist enterprises design energy-efficiency projects, use energy efficient equipment appropriately, and provide training and information. The Centres were originally supported with government funds, but later became dependent on revenues from sales of their services. In 1998, prior to a major government reorganisation, there were 180 Centres employing 3,200 people. During the reorganisation some Centres were closed or merged but many Centres continued and are still active today.

In 1982, parallel with the establishment of the Energy Conservation Centres, work began on drafting an Energy Conservation Law. Work continued on developing the Law for 15 years

until it was finally passed by the National People's Congress (China's Parliament) in 1997. Establishing legislation notoriously takes a long time in China, but the time taken to pass Energy Conservation Law was exceptional. The major reason for this lengthy process was bureaucratic in-fighting among government agencies about which agency should be responsible for what was then a new functional area.

Chinese legislation comprises policy principles rather than specific provisions. The 1997 Energy Conservation Law provided a policy framework that enabled China's 33 provincial-level governments to promulgate detailed local bylaws and regulations on energy conservation. In particular, the Law required all levels of government to arrange funds to implement energy conservation measures and to set limits, in terms of energy consumption per physical unit of product, for products which are energy-intensive to produce.

The Law also required local governments to establish a system for discontinuing backward, over energy-intensive, energy-consuming products and equipment. This led to major programs to close down old, small-scale, and inefficient energy-intensive industrial capacity, including the progressive closure of old, emissions-intensive power stations; these programs continue today. In 2010, the total capacity of emissions-intensive power stations closed down in China exceeded Australia's total installed electricity generating capacity.

The 1997 Energy Conservation Law identified key energy-using entities as those with an annual energy consumption equivalent to more than 10,000 tons of standard coal equivalent. These entities were required to appoint an energy manager and to submit periodic reports to government on energy consumption, energy use efficiency, and the energy conservation measures they implemented.

The Law also authorised various levels of government to "supervise and manage" energy conservation work in their jurisdictions. This led to the establishment of Energy Conservation Supervision Centres – in effect "energy efficiency police" – by many provincial-level governments, with powers to inspect facilities, to levy fines on offenders, and even to close down offenders. In some jurisdictions, energy conservation supervision personnel are organised in squads along paramilitary lines, complete with uniforms.

In 2004, in response to the increase in energy intensity commencing in 2002, the national planning body in China issued the Medium and Long-Term Energy Conservation Plan. The overriding goal of the Plan was to reduce national energy intensity by 20% between 2005 and 2010. The Plan specifically defined "Ten Key Energy-Saving Projects," including: coal-fired industrial boiler retrofits, residual heat and pressure utilization, petroleum saving and substitution, motor system energy saving, and energy system optimization.

The Plan set energy intensity targets for the years 2010 and 2020 for individual energy-intensive industries, including cement, steel, petrochemicals, oil refining, and electricity generation. The Plan also specified raising energy efficiency standards for major energy-using appliances to international levels by 2010.

In 2007, many of the same targets, objectives and policies appeared in both the 11th Five-Year Plan and the China National Climate Change Program.

In 2007, the National People's Congress passed an amended Energy Conservation Law to strengthen the provisions of the 1997 Law, which by that time was largely ignored. The 2007 Law significantly increases the importance of energy efficiency by specifying: "The state implements an energy strategy of promoting conservation and development concurrently *while giving top priority to conservation.*"

The 2007 Law includes a provision that the state "will implement a system of accountability for energy conservation targets and a system for energy evaluation whereby the fulfilment of energy conservation targets is taken as one part of the evaluation of local people's governments and their responsible persons." The Law therefore makes achievement of energy efficiency targets a component of the performance evaluation of local governments and their officials. Individual government officials may be subject to sanctions if energy conservation targets in their areas of responsibility are not met.

The 2007 Law requires reports to government by key energy-using entities to be made annually. In addition to the requirements under the 1997 Law, these reports must also contain information about whether the entity's energy conservation targets were achieved. The Law authorises the imposition of penalties on key energy-using entities that fail to achieve targets or implement energy conservation measures; this covers more than 15,000 enterprises.

The Law also authorises the implementation of a system of differential electricity pricing whereby enterprises in some energy-intensive industries can be charged higher prices if their operations fail to meet energy intensity targets. Differential electricity pricing is applied to energy-intensive enterprises in eight industries. Enterprises are divided into three categories according to resource consumption and technology level. Inefficient enterprises pay surcharges on the standard electricity price.

### **The 1000 Enterprise Program**

In 2006, the central government established the 1000 Enterprise Program, a new system for agreements between government and individual enterprises on specific enterprise energy savings targets, and monitoring and supervision of compliance with these targets. The government requires the top 1,008 energy-using enterprises to participate in the program; together they account for about one-third of China's total energy use.

Under the 1000 Enterprise Program, agreements on energy conservation measures and energy savings targets are established in energy savings responsibility contracts. Central government agencies set the objectives, targets, scope, and implementation guidelines in the contracts. Provincial-level governments are in charge of most of the details of implementation. Progress in each individual enterprise is evaluated annually. Provinces and

prefectures have signed energy savings responsibility contracts with thousands of additional key energy-using enterprises.

### **Energy Efficiency in Buildings**

In 1986, China adopted its first mandatory national energy efficiency building codes; these were for new residential buildings in the cold region and in the severe-cold region. Codes were adopted for the hot-summer-cold-winter region in 2001, the hot-summer-warm-winter region in 2003, and for new public and commercial buildings in 2005. These codes are being progressively updated.

In recent years, China has put significant emphasis on code compliance and enforcement and there has been a sharp increase in compliance by new residential buildings. New programs have been established for energy conservation retrofitting of existing buildings. Progress has also been made on the reforms necessary to achieve significant energy savings in buildings served by district heating schemes in northern China.

### **Support for an Energy Services Industry**

A new energy services industry in China was launched as part of a deliberate plan by the Chinese government with support from the World Bank. In 1995/96 the World Bank and the government agreed to mobilize technical and financial assistance to introduce and develop energy performance contracting (EPC) in China.

Funding was provided to three new pilot Chinese energy services companies (ESCOs) that were started with assistance from three provincial-level governments. This provided the three pilot ESCOs with a dedicated large line of credit to assist with making the EPC business model actually work. Subsequently, private sector ESCOs were started and the industry grew rapidly so that in 2011 there were about 3,900 ESCOs in China.

In 2010, the State Council issued a policy document instructing local governments and ministries to support development of the energy services industry. The government also extended its existing financial incentives for energy conservation to cover qualified EPC projects.

### **Grid Company Energy Efficiency Obligation**

From January 2011, the central government placed an energy efficiency obligation on State Grid and China Southern Grid, the two large government-owned combined electricity transmission, distribution, and retail companies. The obligation requires the grid companies to achieve energy savings of at least 0.3% in sales volumes and 0.3% in maximum load compared with the previous year.

The obligation also lays a foundation for the expansion of demand response programmes by requiring the installation of load monitoring equipment on 70% of the peak load, and load

control equipment on 10% of the peak load, in any locality. The energy and demand targets set by the obligation can be met with end-use energy savings from all economic sectors and from any facility. In addition, reduction of losses in transmission and distribution networks can also be used to meet part of the targets.

## Energy Efficiency and Carbon Targets

In recent years, China has set the following national energy efficiency and carbon targets.

- **11<sup>th</sup> Five-Year Plan (2006-2010)**
  - Energy intensity target – 20% reduction
  - Actual reduction achieved was 19.1%
- **12<sup>th</sup> Five-Year Plan (2011 to 2015)**
  - Energy intensity target: 16% reduction
  - Carbon intensity target: 17% reduction
  - These are “mandatory/binding targets”
- **Total Annual Primary Energy Consumption Target**
  - Capped at 4.0 billion tons of coal equivalent by 2015
  - This is a “non-binding” target
- **Medium-term Carbon Target**
  - Carbon intensity target: 40 to 45% reduction by 2020

Setting of energy efficiency targets started in earnest in the 2004 Energy Conservation Plan and has expanded since then. China’s leadership continues to insist that achieving energy efficiency targets is essential.

National level targets are set by the central government, and are then subdivided and assigned with clear accountabilities for delivery to provincial-level governments and to administrators of key national programs. Provincial-level targets are set by the State Council, based on submissions from provincial-level governments that include factors such as: the development level, industrial structure, energy intensity, total energy consumption, per capita energy consumption, and the level of energy self-supply in the province.

Energy efficiency targets for lower levels of government at the prefectural and county levels are allocated and supervised by provincial-level governments. Targets for individual enterprises under energy savings responsibility contracts are set by the central government for large energy users and by lower levels of government for smaller users. Performance against these targets is evaluated and enforced by officials from Energy Conservation Supervision Centres – the “energy efficiency police.” Individual government officials may be

subject to penalties and/or sanctions if energy efficiency targets in their areas of responsibility are not met.

### **Institutionalisation of Energy Efficiency in China**

China's comprehensive energy conservation policies and programs, particularly since 2006, have achieved a high level of attention among all groups at all levels on how to achieve energy efficiency. These activities have yielded a wealth of new ideas, development of a host of new major programs, promulgation of many new and relatively advanced regulations, and a large organizational effort with massive investments of human resources and money.

The institutional gains include:

- the new legal and regulatory foundations put in place,
- design and implementation experience in a large number of new major programs,
- capacity building at all levels, and generation of innovative new approaches.

New systems have been established to allocate and supervise mandatory energy conservation targets for key energy-using industries, and to provide technical and financial support to help these industries achieve their targets.

Large new programs have been implemented to eliminate particularly wasteful industrial plant and to assess the energy efficiency characteristics of proposed new large projects. Enforcement of national energy efficiency codes and standards has been strengthened. New public energy efficiency funds have been set up and energy pricing policy adjustments have been implemented. A new energy services industry has been developed from scratch. A new energy efficiency obligation has been placed on the two large grid companies that supply electricity to the majority of China.

The overall result has been to institutionalise energy efficiency in China, so that efficiency is now almost automatically considered when new industrial or building projects are being developed or major refurbishments are being planned.

This result has been achieved almost entirely through administrative and regulatory mechanisms which were appropriate when China's economy was entirely based on government command and control. With the continuing move to a more market-based economy, market-based mechanisms to achieve energy savings are now being developed.

It remains to be seen whether these new mechanisms will be as effective as the existing policies and programs in maintaining the ongoing reduction in the level of energy intensity in China.