

Comments on Recent Energy Statistics from China

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INTRODUCTION

It is always advisable to use caution when interpreting statistics. This is especially true when evaluating preliminary figures on energy production and consumption from China. The temptation to seize on newly released numbers and to be the first to decipher them is understandably strong, especially when important trends appear to take surprising turns. This was the case in the late 1990s, when China's officially reported energy production plunged and consumption flattened. It is the case again now, as energy production reportedly surges at double-digit rates, with consumption not far behind. Clearly, important changes are taking place in China's economic system, and very rapid growth is occurring, similar to the overheating episodes of 1992 to 1993 and, to a lesser extent, 1998. However, it seems quite possible that problems in reporting of coal statistics have led to exaggeration of actual trends, such that the fall and resurgence in energy output and use may have been overstated.

ENERGY STATISTICS

Let's start by looking at the official numbers for primary energy (Table 1). These are compiled and reported by China's National Bureau of Statistics (NBS), which bases them on reports from provincial statistical bureaus and from corporations and government agencies in energy industries. NBS is the only source of comprehensive national statistics. All other organizations that report national energy figures for China rely on NBS and its sources. Some report the NBS figures directly and unedited; others "massage" the numbers, often in an attempt to achieve greater compatibility of China's reporting method with their own. Official statistics are not necessarily always accurate, of course, but they are an irreplaceable starting point for analyzing a national energy system.

Not all energy is measured in the same way, and thus statistics on different types of energy display differing degrees of accuracy (Sinton, 2001). Electricity generation is easy to meter, and so is consumption, though to a lesser extent. Production and imports of oil are well measured, as are refinery runs, so aggregate figures on output and apparent consumption are relatively trustworthy. However, in China's case, actual consumption is not easily measured as stock build and stock draw numbers are not released monthly, like production and trade data are. Natural gas information comes from just a few sources, and travels through heavily monitored pipelines and port facilities. Figures for biomass fuel use are always known to be estimates, with a wide band of uncertainty. These educated guesses do not make their way into national energy statistics, even though the average rural household depends on biomass for about 80% of final energy needs.

Year	Production					Consumption				
	Coal	Oil	Natural Gas	Hydro-electricity	Total	Coal	Oil	Natural Gas	Hydro-electricity	Total
1980	13.0	4.4	0.6	0.7	18.7	12.8	3.7	0.5	0.7	17.7
1981	13.0	4.2	0.5	0.8	18.5	12.7	3.5	0.5	0.8	17.4
1982	14.0	4.3	0.5	0.9	19.6	13.4	3.4	0.5	0.9	18.2
1983	15.0	4.4	0.5	1.0	20.9	14.4	3.5	0.5	1.0	19.4
1984	16.5	4.8	0.5	1.0	22.8	15.7	3.6	0.5	1.0	20.8
1985	18.3	5.2	0.5	1.1	25.1	17.0	3.8	0.5	1.1	22.5
1986	18.7	5.5	0.5	1.1	25.8	18.0	4.1	0.5	1.1	23.7
1987	19.4	5.6	0.5	1.2	26.8	19.3	4.3	0.5	1.2	25.4
1988	20.5	5.7	0.6	1.3	28.1	20.8	4.6	0.6	1.3	27.3
1989	22.1	5.8	0.6	1.4	29.8	21.6	4.9	0.6	1.4	28.4
1990	22.6	5.8	0.6	1.5	30.5	22.0	4.8	0.6	1.5	28.9
1991	22.8	5.9	0.6	1.4	30.7	23.1	5.2	0.6	1.5	30.4
1992	23.4	6.0	0.6	1.5	31.4	24.2	5.6	0.6	1.6	32.0
1993	24.1	6.1	0.7	1.7	32.6	25.4	6.2	0.6	1.8	34.0
1994	26.0	6.1	0.7	1.9	34.8	27.0	6.3	0.7	2.1	36.0
1995	28.5	6.3	0.7	2.1	37.8	28.7	6.7	0.7	2.3	38.4
1996	29.2	6.6	0.8	2.3	38.9	30.4	7.3	0.7	2.2	40.7
1997	28.8	6.7	0.8	2.5	38.8	29.0	8.3	0.7	2.5	40.5
1998	26.2	6.7	0.9	2.6	36.4	27.0	8.3	0.9	2.6	38.8
1999	21.8	6.7	1.0	2.4	32.0	25.9	8.8	0.8	2.5	38.1
2000	20.9	6.8	1.1	2.6	31.4	25.2	9.4	1.0	2.6	38.2
2001	24.3	6.9	1.2	3.1	35.4	25.8	9.6	1.1	3.0	39.5
2002	28.8	7.0	1.3	3.6	40.7	28.7	10.2	1.2	3.4	43.4

Table 1. China's primary energy structure is dominated by coal on both the production and consumption sides, despite quickly growing oil use and a reported temporary drop in coal (NBS, 2003a).

That leaves coal, China's most important and abundant fuel. Because of its dominance, and because of known deficiencies in coal figures, the story of uncertainty in China's energy statistics is really a story of coal. While recent official statistics show a surge in coal production and use, these need to be viewed with a critical eye, and, at the very least, compared to major indicators that are correlated. Recent annual and monthly statistics on economic growth, output of industrial goods, investment, and prices, as discussed in the following sections, display trends that are generally consistent with the trends in coal, providing support for the position that the direction, if not necessarily the exact extent, of the reported trends in energy use are credible.

There are two main types of market for coal. The first brings together large state-owned mines, the biggest of which produce several million tons of product each year, with large, often state-owned consumers, such as power plants and iron and steel smelters. This coal is typically sold through long-term contracts, and transported long distances. The other coal market is local, bringing together small mines, some producing a few hundred tons of coal or less annually, and small industrial, residential, and commercial consumers. The large-scale market bears some resemblance to markets for oil products, with volumes of production, trade and consumption easily tracked. As is the case with oil, stockpile figures are not available regularly. The small-scale market, on the other hand, is poorly characterized, and there is much less certainty regarding the amounts involved. Non-state, generally small mines currently produce about 30% of total coal output (Interfax, 2002). The inaccuracy in the data on local coal markets has been compounded by the government's campaign to close down small, unsafe coal mines, begun in 1997. Official

reports claim that tens of thousands of small mines have been closed down, and this campaign was accompanied by a huge drop in reported coal production, and a somewhat lesser fall in coal consumption in the late 1990s. There is considerable evidence, however, that actual coal output and use did not fall as much as official statistics suggest (Sinton, 2001). Consequently the more recent very rapid growth in coal output represents not just actual growth (which is corroborated by trends in economic and investment indicators, as described below), but also, it is to be hoped, a return to more credible reporting.

Preliminary figures for the first eight months of 2003 report that coal output rose over 17% compared with the same period last year, and electricity generation (four fifths from coal-fired plants) by over 16% (NBS, 2003b). These rates are comparable to those for other industrial products, discussed below, creating a consistent picture of expansion. Electricity demand has risen even faster than generation, in part due to hotter than normal summer weather. Nineteen provinces have reportedly suffered blackouts, and the NBS has declared that power shortages are constraining economic growth (CEN, 2003a).

ECONOMIC TRENDS

Under ordinary circumstances, the overall rate of growth of the economy would be enough to persuade most observers that energy demand was certainly on the rise. So far in 2003, reported real growth has outpaced even the 8% seen in 2002 (Table 2). In most industrializing countries, energy use rises faster than economic output. By contrast, the energy demand elasticities of GDP (i.e., the ratio of growth in energy use to growth in GDP) for most developed countries since the 1970s have been less than unity.

China, almost alone among developing nations has exhibited the same phenomenon. It already has an extensive industrial base, and since the late 1970s economic output has grown faster than overall energy consumption (although electricity use has kept pace with or grown faster than the economy). In the late 1990s, however, energy use fell, a phenomenon that, while still not fully explained, appears to have resulted from a combination of closing factories, improved efficiency, structural change, fuel switching, and faulty statistics (Wu *et al.*, 2003; Sinton and Fridley, 2000). If the economic and energy statistics for 2002 are correct, though, for the first time since the recession of 1989, China will have an energy elasticity of GDP greater than one.

<i>unit: % growth over previous year</i>	Agriculture	Industry & Construction	Services	Total
1990	7.3%	3.2%	2.3%	3.8%
1991	2.4%	13.9%	8.8%	9.2%
1992	4.7%	21.2%	12.4%	14.2%
1993	4.7%	19.9%	10.7%	13.5%
1994	4.0%	18.4%	9.6%	12.6%
1995	5.0%	13.9%	8.4%	10.5%
1996	5.1%	12.1%	7.9%	9.6%
1997	3.5%	10.5%	9.1%	8.8%
1998	3.5%	8.9%	8.3%	7.8%
1999	2.8%	8.1%	7.7%	7.1%
2000	2.4%	9.4%	8.1%	8.0%
2001	2.8%	8.4%	8.4%	7.5%
2002	2.9%	9.8%	7.5%	8.0%
Jan-June 2003	2.7%	11.6%	4.2%	8.2%

Table 2. China's GDP statistics have been challenged by some, and may be overstated in some years. However, even if the officially reported real growth rates are only broadly indicative, the scale of economic expansion has been extraordinary (NBS, 2003a, 2003b).

Just as some economists have pointed to likely exaggeration of GDP in the late 1990s, though, it is possible that recent economic expansion has been, if anything, understated (Rawski, 2001; Bradsher, 2003). If the analysts at Goldman Sachs are correct, official GDP statistics may be “smoothed” to reduce the appearance of boom and bust cycles, and so understate growth during periods of rapid expansion and overstate growth when the economy is weaker. If this were correct, it would help to reconcile some of the anomalies apparent in past and current statistics—and it might mean that the actual energy elasticity in 2002 did not exceed unity. The disaggregated data for economic indicators and energy consumption needed to properly evaluate this possibility, however, will not be publicly available for some time yet. The figures available now are roughly consistent, but are not of sufficient quality to support detailed conclusions.

INDUSTRIAL PRODUCTS

A great deal of attention is rightly given to transport, services and household and their impact on energy demand. Nevertheless, industry still accounts for more than two thirds of energy end use, and growing demand in other sectors is predicated on a steady supply of manufactured goods, ensuring that industry will remain the dominant energy consumer in China for many more years. Most coal is used in industry and in electric utilities. A few energy-intensive products, then, determine a very large share of the country’s coal demand, and thus total energy demand. Manufacturing a ton of steel requires over a ton of coal, and China makes more steel (and cement and many other energy-intensive products) than any other country in the world. Expanded production means new capacity in factories, which, combined with retrofits needed to keep older facilities competitive, results in more energy-efficient production. The pace of improvement in technical energy efficiency (amount of energy require to produce one unit of output), however, is no match for the astonishing rate at which output has been expanding (Table 3). It seems likely that this pace will eventually slack off, but in the mean time, it is certainly driving significant growth in demand for coal, electricity, and other energy products.

The extraordinary rapidity with which new cars and trucks are being put on China’s roads ensures new and lasting demand for oil—incremental demand for which must be supplied by imports, as discussed in a later section (Chinese Academy of Engineering and National Research Council, 2003).

<i>unit: % growth over previous year</i>	1995	1996	1997	1998	1999	2000	2001	2002	Jan-Aug 2003
Crude Steel	3.0%	6.2%	7.6%	6.1%	7.5%	3.4%	18.0%	20.3%	21.1%
Cement	12.9%	3.3%	4.2%	4.7%	6.9%	4.2%	10.7%	9.7%	16.1%
Caustic Soda	23.8%	7.9%	0.1%	-6.1%	7.6%	15.1%	18.0%	11.4%	15.2%
Ethylene	12.7%	26.6%	18.0%	5.2%	15.3%	8.0%	2.3%	13.0%	16.5%
Motor Vehicles	6.3%	1.5%	7.3%	3.0%	12.4%	13.0%	13.1%	38.8%	36.8%

Table 3. Output of key industrial products reflects an acceleration in growth since 2001, with the pace especially strong for energy-intensive intermediate products that require large amounts of coal, and for key energy-using manufactured goods, like motor vehicles (NBS, 2003a, 2003b).

INVESTMENT

A great deal of China's economic growth has been driven by continuing large investment in infrastructure, building, and industrial capacity. As in previous episodes of overheating, growth in investment has risen into double digits, with total investment (excluding collective and private firms) in fixed assets reportedly growing over 32% in the first eight months of 2003 (NBS, 2003b). Among industrial subsectors, investment in steel grew fastest, at 126%. In energy, coal investment rose particularly rapidly, at 59%, while investment in electricity and oil reportedly grew by 27% and 11%, respectively. While these are unadjusted nominal figures, rates of inflation have been quite low in China (the consumer price index has been up by less than 1% so far in 2003 [NBS, 2003b]), so these would be expected to be close to real rates of growth. Moreover, these interim figures are consistent with the industrial indicators discussed above, such as rising output of coal, electricity, and generating equipment.

However, caution is in order, because the interim investment figures released monthly by NBS typically exaggerate trends compared to annual figures released at later dates. For instance, in 2002, growth in investment in the first eight months was reportedly up by 24% over the same period in 2001, while NBS later reported that nominal growth in investment in the same category was 17% for all of 2002 (NBS, 2003a). Similar patterns can be observed for other investment indicators, and for economic indicators as well. Although they may overstate the extent of trends, interim indicators do provide broad evidence for the direction and extent of changes in investment.

PRICES

One would expect prices of coal and electricity to reflect the balance between supply and demand. Coal prices slid in the late 1990s, as demand dropped off, but in 2002 and early 2003 prices began to rise again, particularly for coking coal, consistent with the rising demand described above (Figure 1). The current outlook is uncertain, and there may be signs of the overproduction that has often afflicted the coal industry. There are reports that domestic prices of coal (except anthracite) are once again dipping, and that stockpiles at ports and at end-user facilities are rising (CEN, 2003b).

As China's market for coal is largely domestically supplied, with imports playing only a marginal role in the south and exports taking less than 10% of total production, prices reflect mainly the trends of domestic supply and demand. Oil prices, on the other hand, are linked to international prices through a formula based on average monthly prices in Singapore, Rotterdam, and New York Harbor, and thus do not provide market guidance to the oil companies on emerging regional supply and demand imbalances. In mid-2003, both Sinopec and PetroChina were caught unprepared for the apparent surge in gasoline and diesel demand during the summer, leading to reported regional shortages (Interfax 2003). Moreover, as both companies attempt to keep their profit margins high, they have been reluctant to push pump prices even higher, preferring instead to squeeze the wholesale price margin, in order to avoid dampening consumer demand.

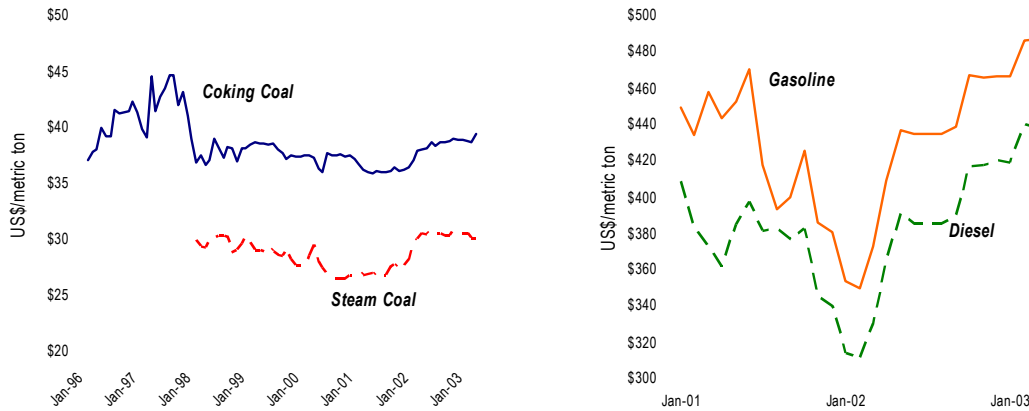


Figure 1. China's average coal prices fell in 1997, at the same time that production began to slide, and rose in 2002 as demand picked up once again. Domestic prices for oil products track international price trends (BECon, 2003).

Retail electricity prices also do not follow supply and demand patterns. In fact, in the recent past when electricity was in surplus, the government moved to bring consumer prices down by abolishing a number of local tariffs and surcharges. This may have supported the rapid growth in household appliances, which (especially air conditioners) are now a major source of the high peak loads in major cities that have led to power cuts and brownouts this year. The desire to keep electricity costs low led to a clash between power and oil policies in Guangdong earlier in 2003. While Guangdong was experiencing an early peak power load, imported fuel oil prices were rising. Guangdong generators, highly dependent on oil, pushed to raise their electricity prices as fuel prices rose. The provincial government overruled them, and maintained the four price cuts implemented in 2002 to favor industrial and rural consumers. Facing possible oil-fired power plant shutdowns that would have exacerbated the shortages, the government agreed to investigate linking power prices to fuel oil prices for the first time. (CEN, 2003c)

TRADE

China's primary energy import is oil, and China has been a net oil importer since 1993. Trade statistics are compiled and issued monthly by the China's Customs General Administration, though detailed breakdowns of import data (to 8-digit HS codes) are not available until a year following. In 1997 and 1998, reports of high levels of oil product smuggling in coastal China emerged, leading both to a strong government crack-down and to the revamping of its oil policy, linking Chinese oil prices closer to the international market and favoring the processing of crude domestically over the import of products.

Partial customs data for the first seven months of 2003 reveal strong increases in China's demand for oil (CCGA, 2003). The bulk of China's oil imports is crude oil and fuel oil, and in the first seven months, crude imports rose nearly 30% to a record annual rate surpassing 100 million tonnes (Mt), compared to 69 Mt imported in 2002. As domestic crude production is stagnant, these imports supported a rise in domestic refinery throughput of nearly 9%, expanding the supply of oil products for the domestic market.

Nonetheless, the high degree of processing in domestic refineries has left China deficit in fuel oil, for which it is now nearly 50% import-dependent. Much of this fuel oil is destined for power plants along the southern coast, where coal transported from northern China is less competitive. Indeed, in the first quarter of 2003, when Guangdong was already experiencing historically high peak periods of power usage, fuel oil imports surged 79% nationally to an annual rate of 19.5 Mt. (CEN, 2003d). Reflecting this strong growth in oil demand despite increased refinery output, total imports of oil products (including naphtha, jet kerosene, diesel, fuel oil, lubes and asphalt) in the first seven months of 2003 rose 56% to an annual rate of nearly 28 Mt, compared to 21 Mt imported in 2002.

Similarly, imports of many industrial products and industrial raw materials rose sharply, even with the expansion of industrial production discussed earlier. In the first seven months of 2003, imports of steel surged 55%, while imports of iron ore jumped 39%. Imports of copper ore and concentrates, relieving a severe domestic shortage, rose 13% despite import prices over 60% higher than in 2002. Imports of motor vehicles jumped 63% and that of vehicle parts by 138%, paralleling the 37% rise in domestic output over this period. These trends in international trade reinforce the overall impression of rapid growth in energy-intensive economic activities that would be consistent with expanding energy demand.

CONCLUSIONS

Nothing can substitute for improvements in China's apparatus for collection of energy statistics, which will take significant resources and time to achieve. In the meantime, analysts must be aware of the problems afflicting China's energy statistics, and use common sense in interpreting them. While "triangulation" with statistics that are closely related to energy output and consumption is not a full solution, it at least offers a way to evaluate official statistics and make adjustments. The preliminary data now available are insufficient to confidently assign numbers to the indicators of interest, or to fully assess the structural and technical factors behind recent developments. Given those caveats, the evidence currently available seems to indicate that China has indeed experienced rapid growth in coal use and energy use overall in 2002, and very likely also in the first eight months of 2003, driven by an episode of overheated investment and economic expansion. However, if China follows the example of its similar episodes in the past decade, growth in the economy and the energy system will soon return to more moderate levels.

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