



The China Sustainable Energy Program  
中国可持续能源项目

**CHINA PROGRAM UPDATE & CLIPPINGS**

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**Message from the Director:**

China’s energy crisis continues. Electricity demand exceeds supply in 24 provinces. Local governments are building a new 1,000-megawatt coal-fired power plant *every week*, and are likely to add some 60,000 megawatts this year (on top of 50,000 megawatts in each of the last two years). Total electricity capacity now exceeds 500,000 megawatts—ten Californias. Torrid growth of heavy industries is behind the added demand; China now consumes half the world’s cement, a third of the world’s coal, a quarter of all steel, and two-fifths of all copper. China’s coal consumption surpassed 2 billion tons last year—twice the level of the U.S. and could grow another 15 percent this year. Most analysts see overinvestment in energy supply leading to an electricity surplus within two years, an expected “boom-bust” cycle that’s behind much of ongoing FDI capital flight.

Energy efficiency investment—managing demand instead of adding supply—continues to lag. China’s senior leaders, including President Hu Jintao and Premier Wen Jiabao, are calling for stepped up energy efficiency. In May, the State Council launched an “Energy Leading Group” to oversee government ministries and state-owned industries. The main aim of the institutional shakeup is to strengthen cross ministerial coordination and improve energy efficiency.

In this newsletter, we review the latest energy efficiency and renewable energy policy developments in our six

program areas—renewable energy, electric utilities, industry, buildings, transportation, and low-carbon development paths—as well as conferences and workshops that we’ve sponsored. For example, staff presented at a State Council-sponsored China Development Forum in late June, and called for least-cost energy planning, tripled investment in demand-side efficiency, and incentive policies to temper energy consumption by the largest 1000 industrial enterprises (facilities that consume 30 percent of *all* China’s energy).

Our main challenge continues to be government underinvestment in administrative capacity to support energy efficiency and renewable energy regulation and incentive policies, particularly at the local level. We continue to emphasize tax and fiscal policies to facilitate implementation, which will be the emphasis of our Senior Policy Advisory Council meeting at the Great Hall of the People in Beijing this November. The Ministry of Finance and the National Development Reform Commission have both accepted our invitation to co-host these events.

We appreciate your continued interest in futhering a sustainable energy future.

Best regards,

Doug Ogden

<b>Contents</b>	
Program Updates . . . . .	2
Workshop Updates . . . . .	4
China’s Burning Ambition . . . . .	7
China Preparing to Tax Vehicles with Large Engines . . . . .	11
High-speed City Buses to Tackle China’s Congestion . . . . .	13

## Program Updates—September 2005

### Renewable Energy

Shanghai launched China's first **green pricing program**. Fifteen large enterprises agreed to pay 6.5 cents per kilowatt-hour for wind electricity, and signed long-term contracts for half the total output of a new wind farm in the city's suburbs. Shanghai subsequently announced construction plans for another 20 megawatts of wind.



#### **New wind turbine in a Shanghai suburb**

The National People's Congress promulgated the **Renewable Energy Law** in March 2005. The law calls for 10 percent of all electricity to come from renewable energy in 2020, and includes a requirement of at least 120,000 megawatts of renewables in that year. (This is 50 percent more renewables than the U.S. renewable portfolio standard that was recently stripped out of the U.S. Energy Bill.) Grantees are currently assisting NDRC to develop implementing regulations, including favorable feed-in tariffs, sharing of incremental costs nationally, and a national public benefits fund to finance renewable energy projects. Final rules are expected in January 2006.

Over 1,000 MW of new wind projects—about US \$1 billion in investment—are under construction through **wind concession projects** designed and implemented by grantees. Once completed, these projects could save over 600,000 tons of carbon emissions annually. Grantees completed in August 2005 another batch of wind concessions totaling 400 MW, to be tendered to wind developers in the next a few weeks.

### Electric Utilities

The Asia Development Bank committed to support the development of "**Energy Efficiency Power Plants**" (EPP) in China. An EPP finances and installs energy-saving end-use equipment (lighting, air conditioning, electric motors, etc.) to offset construction of new power plants. EPPs in Beijing, Jiangsu, and Shanghai are in the planning phase, and could set national precedent for investing in cheaper, faster, and cleaner energy efficiency instead of coal plants.

NDRC issued an **emergency decree to halt the construction of unauthorized power plants**, estimated to be over 120,000 megawatts (MW) (two and a-half California's), instructing government agencies, banks and grid companies to deny land permits, loans, and grid connection to these power plants. SEPA also publicized those power projects failing to meet environmental requirements, thus increasing public pressure on the project owners. Despite these efforts to control local government coal investments, China continues building a 1,000-MW coal plant *every week*. The lack of central regulation, and responsiveness of local jurisdictions to central regulation, continues to be an enormous challenge.

In April 2005, NDRC issued **electricity pricing** policies developed by grantees, including for interconnection, transmission, distribution, and retail tariffs. The regulations eliminate a number of cross subsidies and make prices more cost-reflective. Of particular importance are new feed-in tariffs for renewable energy and time-of-use (TOU), interruptible load, and critical peak tariffs that will encourage demand-side management and end-use efficiency.

In summer 2005, national electricity shortages amounted to approximately 30,000 MW of peak capacity. Central, provincial, and local governments and utilities deployed **demand-side management (DSM)** to reduce load requirements. For example, Jiangsu and Shanghai, our DSM pilot provinces, succeeded in cutting peak load by 6,000 and 3,000 MW respectively. Although the bulk of these savings involved shifting industrial load off-peak, a significant component involved savings from installing more efficient appliances and manufacturing equipment. In Jiangsu, efficiency projects cut annual electricity load

by over 930 million kWh—an annual carbon savings of 250,000 tons with first-year economic savings of over US \$70 million.



**NDRC is launching a “Top-1000 Energy Intensive Enterprises Management Program”**

## Industry

Premier Wen Jiabao called for expedited efficiency in large industrial enterprises, including adopting **energy savings targets** piloted by CSEP grantees in Shandong Province. Grantees launched a “Top-1000 Energy Intensive Enterprises Management Program” to increase the pollution levy on enterprises and make it refundable so long as enterprises meet energy efficiency targets. Two steel enterprises in Shandong modeled this approach and met their efficiency targets ahead of schedule at a profit. The Premier called for national implementation of industrial energy efficiency.

Grantees submitted an **electric motors standard** to the Standardization Administration of China for approval. The standard could become effective in 2008 and could save over 21 million metric tons of carbon in 2020.

## Buildings

The Ministry of Construction (MOC) issued China’s first national commercial building code in April 2005, which, if fully implemented, could cut 50 million tons of carbon in 2020.

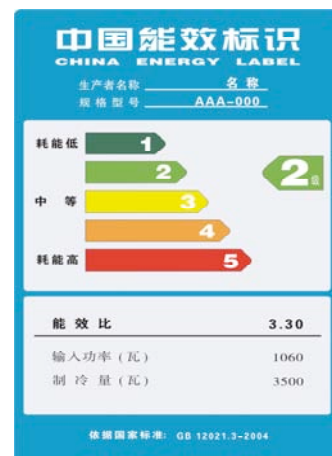
MOC announced a national strategy to require *every* building to be “energy-saving and land-saving.”

Local building code implementation is improving. In May 2005, MOC issued national regulations requiring local governments to implement residential and commercial building codes, and the **State Council is now elevating codes compliance** into new *Management Provisions of Building Energy Efficiency*—provisions that cannot be ignored by local governments.

Shanghai, a lead pilot for building code implementation in the Central China climate zone, promulgated China’s first comprehensive **local code enforcement provisions** in August 2005. The requirements should insure that every building constructed in Shanghai will go through rigorous energy code compliance procedures. Our other four local pilot cities are catching up: Guangzhou, Shenzhen, Fuzhou, and Xiamen have all issued decrees to require designers to comply with energy codes, and are working on developing local provisions to regulate every step of the construction process for code compliance.

**Appliance standards for gas water heaters and power supplies**—that include “reach” requirements for incorporating international best practice—are under final review by the Standardization Administration of China, and are expected to be approved in November 2005.

**Information labels**, which grade the energy performance of appliances and encourage consumer purchases of the most efficient products, are now national law. In March 2005, the central government required manufacturers to affix the labels to all electrical products. Air conditioner and refrigerator information labels went into effect on September 1, 2005.



## Transportation

### Advanced Vehicle Technologies

China's landmark **fuel economy standards** for light-duty vehicles (including SUVs) went into effect on July 1. Premier Wen Jiabao endorsed the standards, and called for "full mandatory" implementation. Cars failing to meet the standards are now banned from sale.

The State Standardization Administration agreed to develop **fuel economy standards for light-duty trucks**. Grantees are developing a consumer label that identifies the fuel efficiency of cars and trucks at the point of sale.

Toyota announced plans to begin manufacturing the **hybrid Prius** in Changchun by the end of 2005. Grantees are working with the city of Shenzhen to procure a hybrid taxi fleet, which could guarantee the purchase of several thousand hybrid vehicles.

The Ministry of Finance adopted an excise, **luxury tax on passenger vehicles** that increases with engine size. The tax, covering seven engine sizes, is aimed at encouraging the purchase of smaller, compact vehicles. The largest engines (4-liter and larger, common in US SUVs) pay a 20 percent penalty at the point of purchase (approximately US \$8,000); the smallest engines pay one percent. (See article in this issue.)

China announced **fuel quality targets** of 50 ppm sulfur in both gasoline and diesel, nationwide, by 2012.

SEPA adopted **tailpipe emissions standards** requiring light-duty vehicles to meet Euro III by 2007, and Euro IV by 2010. Beijing will go faster: Euro IV for light-duty diesel vehicles by the end of this year, and Euro III for gasoline light-duty and heavy-duty vehicles also by the end of this year.

### Bus Rapid Transit

Beijing's first 16-kilometer **bus rapid transit corridor** will be completed by year-end; two-thirds will be in operation by October 1. The city formalized plans for another 60 kilometers in time for the 2008 Olympics.

Jinan, the capital of Shandong Province, began building its first BRT corridor. Jinan is receiving help from Logit, which designed Bogota's Transmillenio. The corridor should be completed in six months.

Kunming is upgrading its bus priority system to a full-scale BRT system.

Hangzhou adopted an innovative financing program: 2.5 percent of all land leases will go to bus mass transit including BRT, raising over US \$30 million annually.

The Hewlett Foundation-supported **China Sustainable Transportation Center** completed its hiring and is in full operation in Beijing. The Center provides technical support to the twenty cities now designing or building BRT systems.



BRT advertisement in Beijing

## **Workshop Updates 2005**

### The Sixth Dialogue Partners Meeting in Beijing

We held our Sixth Dialogue Partners Meeting in Beijing Huairou July 2-3, 2005. Experts from the Development Research Center of the State Council, the Research Institute for Fiscal Science of the Ministry of Finance (MOF), and the Economic Research Institute of the National Development and Reform Commission (NDRC) provided updates on tax, fiscal, and pricing policies that could catalyze national and private investment in clean energy technologies.

Chinese experts addressed the need for institutional reform and regulatory supervision in order to effectively impose regulatory requirements for energy demand management. Tax, fiscal, and pricing policies were

emphasized as appropriate means for catalyzing sustainable energy technology investment.

Three key recommendations were emphasized: (1) Least-cost energy planning (integrated resource planning) needs to be adopted nationally, and soon. When energy efficiency (investment on the demand side in energy-saving equipment) is cheaper than new supply, then permits for new supply should be barred while investment in demand-side energy savings technologies should be required; (2) Energy efficiency power plants, where demand-side energy savings equipment is procured in the same volume in savings as would otherwise be supplied by new power plants, should be required nationwide; and (3) the 1,000 largest energy-consuming enterprises should be compelled to invest in energy-saving equipment by assessing a very high pollution levy, refundable if the enterprise successfully implements energy efficiency targets.

After hearing the recommendations, participants discussed several major problems facing China's energy field, particularly low administrative efficiency and unclear responsibility within the government in the implementation of energy policies.

### **2005 China Development Forum: "Building a Resource Efficient Society"**

The 2005 China Development Forum, on "Building a Resource Efficient Society," was held at the Diaoyutai State Guesthouse in Beijing June 24-26. Vice Premier Zeng Peiyan provided a keynote address emphasizing that a resource efficient society is the major focus of the 11<sup>th</sup> Five-Year Plan for national economic and social development. He emphasized that, through 2020, China will strive to develop a "circular economy" that maximizes recycling while lowering pollution. To do this effectively, energy must become sustainable through maximizing energy efficiency and renewable energy development. China's sustainable development will not be possible without sustainable energy—including energy efficiency and renewable energy.

Other topics covered included climate change, water conservation, mineral resources, and land conservation. The forum was co-sponsored by the National Development and Reform Commission and the State Council Development Research Center. Over 400 representatives from the National People's Congress

(NPC), State Council, government agencies, and international organizations attended the conference.

### **International Workshop on Building Energy Efficiency Incentive Policies**

On May 12, 2005, the "Building Energy Efficiency Incentive Policy International Symposium" was held in Beijing. Experts from the International Energy Agency, American Council for an Energy-Efficient Economy (ACEEE), National Resources Defense Council (NRDC), as well as the China Energy-Efficient Refrigerator Project introduced strategies for establishing and implementing energy-efficiency incentive policies.

The participants agreed on the need to integrate incentive policies and international experience in the development of energy efficient buildings. Policy recommendations included adopting an energy tax or eco-tax, electricity surcharges for subsidizing efficient technologies, tapping existing government funds for advanced building materials, and launching pilot programs that showcase efficient buildings supported by incentive policies.

The Energy Research Institute of the National Development and Reform Commission, Research Institute for Fiscal Science of the Ministry of Finance, and the China National Institute of Standardization sponsored the workshop, with CSEP support.

### **International Workshop on Promoting Industrial Energy Efficiency Through Tax and Fiscal Policies**

On May 24, 2005, the China Energy Conservation Investment Corporation, the Research Institute for Fiscal Science of the Ministry of Finance, and NDRC's Department of Environment and Resource Comprehensive Utilization held a workshop highlighting policy programs to cut industrial greenhouse gas emissions and improve environmental performance through energy efficiency. China has 1,017 large energy-consuming enterprises that consume fully 40 percent of all China's primary energy. Participants discussed how various international practices could help make these enterprises less wasteful, more modern, more clean, and profitable.

For example, in the UK, industrial enterprises are assessed a high "carbon levy" that is refundable if the

enterprise reaches an energy efficiency improvement target. UK enterprises have nearly unanimously attained the efficiency targets *at a profit* due to energy savings, and received a tax rebate on top. Workshop attendees agreed that this highly successful program is a best practice model that could be adapted to China's circumstances.

### **Shanghai Sustainable Energy Program Report Meeting**

On May 15, 2005, the Shanghai Energy Conservation Supervision Center held a workshop to review Shanghai's sustainable energy policy programs to date. Prominent Shanghai government officials and local grantees provided presentations on demand-side electricity management efficiency, green power programs, air conditioner efficiency, promotion of energy efficiency in residential buildings and public buildings, and programs to advance clean vehicle commercialization.

Xia Liqing, commissioner of the Shanghai Decision-making and Advisory Committee, stressed the importance of reducing energy consumption, developing renewable energy, and constructing Bus Rapid Transit (BRT) systems. Le Jingpeng, deputy director of the Shanghai Economic Committee, noted that investing in energy efficiency *while* designing factories and buildings, rather than after, can double efficiency with half the costs. Jiang Yingshi, director of the Shanghai Development and Reform Commission, focused on the need to shift energy policy by both enhancing demand-side management and developing renewable energy. He also emphasized the political pressures and long-term goals fueling Shanghai's sustainable energy development: Shanghai aims to become (1) an international metropolis with "four centers" by 2020, and (2) the cleanest large city in China in time for the 2010 World Expo.

### **Enactment of the Shanghai Green Power Purchasing and Marketing Tryout Method**

Last year, co-funded by the World Bank and Energy Foundation, the Shanghai Energy Conservation Supervision Center (SECSC) researched green power mechanisms for use in Shanghai. This June, based on SECSC's research, the Shanghai Economic Committee and the Shanghai Development and Reform Commission

formulated the *Shanghai Green Power Purchasing and Marketing Tryout Methods*. Using their recommendations, 12 enterprises, including Baoshan Iron & Steel Co. Ltd., Shanghai Tobacco (Group) Corporation, and Panasonic Corporation, voluntarily purchased green electricity produced by wind farms in Shanghai, marking the establishment of China's first green pricing program.

Shanghai's green power prices are about 0.53 yuan per kilowatt-hour higher than regular power prices. Thus, these large commercial consumers have agreed to pay this small premium in order to stimulate commercialization of green power. The proceeds from the sale of green power are used to support construction of new renewable energy facilities. At present, four 850-kW wind power generators have been installed in the Fengxian District of Shanghai, and two 20-megawatt wind power factories in Chongmin and Nanhui are planned for commercial operation by the end of June 2006.

### **Media Awards: The Second "Star of Sustainable Energy Reporters" Award Ceremony Held**

The second "Star of Sustainable Energy Reporters" award ceremony, sponsored by Goba Village Beijing, was held on June 26, 2005.

Seven special awards were awarded to *Science and Technology Daily* reporter Hua Ling, *China Daily* reporters Xie Hua and Wang Ying, *Guangming Daily* reporter Feng Yongfeng, *Beijing Youth* reporter Sun Danping, *Economy Daily* reporter Li Wenyuan and Xinhua News Agency reporter Chang Zhipeng. Nine outstanding prize winners went to *Can Kao Xiao Xi* reporter Fan Jinghua, *Science Times* reporter Zhen Jinwu, *Chinese Electric Power* reporter Lai Shaoming, *Chinese Economic Herald* reporter Dong Lu, *People's Daily* Reporter Zhao Yongxin, *China Quality* reporter Ding Ying, *Beijing People's Broadcasting Station* reporter Kang Xue, and CCTV reporter Ye Zhongkui and Tang Jingping. All award recipients had been participants in the "Sustainable Energy Reporter Forum" and are committed to reporting on sustainable energy-related news. Some serve as environmental protection volunteers.

Former UN deputy secretary-general Maurice Strong spoke at the event and presented the awards.

There are 171 members in the “Reporter Club” having published over 600 sustainable-energy related pieces, covering such areas as energy efficient buildings, household appliance energy labels, urban energy development, climate change, sustainable transport, Bus Rapid Transit (BRT), renewable energy, demand-side management (DSM), fuel quality, fuel economy, and energy legislation.



nature

International weekly journal of science

### China's Burning Ambition

*The economic miracle that is transforming the world's most populous nation is threatened by energy shortages and rising pollution. It also risks plunging the planet's climate into chaos.*

By Peter Aldhous  
June 30, 2005

China is booming, and its hunger for energy is insatiable. For its people, the dismal air quality across much of the country is a constant reminder of its reliance on coal and other dirty fuels. When *Nature* visited Beijing to meet the technocrats responsible for China's energy policy, the city was blanketed in acrid smog. After just a few days of stagnant weather, visibility in some districts had dropped to tens of metres. Flights

were delayed and the Beijing Environmental Protection Agency advised people to stay indoors. You could almost taste the sulphur in the air.

Energy and its consequences for health and the environment are high on the Chinese political agenda. But the hardheaded approach of the country's leaders should give us all pause for thought. China's energy policy will continue to be based around coal, they say, so the question of whether this notoriously filthy fuel can ever be made 'clean' is central to the country's development — and to the long-term stability of the global climate.

The most immediate problem for China is that its economic growth is already outstripping its energy supplies. In boomtowns from Shenzhen to Chengdu, electricity is now an unstable commodity. Last year, 24 of China's 31 provinces, municipalities and autonomous regions admitted that they lacked sufficient power. In the summer, when drought curtails hydropower and air conditioners surge into life, blackouts have become commonplace.

The nation's coal mines are straining to meet the demand, at a terrible human cost. According to conservative official estimates, more than 6,000 workers were killed in China's mines last year — making them the world's most dangerous — and the death rate was undiminished in the first half of 2005.

Most coal-related fatalities never make the headlines, however. Many Chinese cities fail to meet international — or even their own — standards for air quality, causing hundreds of thousands of premature deaths each year. China's increasing use of coal is also sending CO<sub>2</sub> emissions skyrocketing, threatening a global climate disaster. “We understand that coal means not only energy, but also social and environmental impacts in the long term,” says Zhou Dadi, director-general of the Energy Research Institute in Beijing and a leading adviser on energy strategy to China's leaders.

While Dadi and other senior energy planners recognize these problems, their enthusiasm for coal remains strong. The country's leaders are determined that its economy will quadruple in size by 2020, which will require at least a doubling of the energy supply. Coal will bear most of the burden. “We have to increase coal consumption,” says Guo Yuan, an energy systems analyst at Dadi's institute. “It's not a good picture, but

we have to do it.”

Electricity generation is by far the biggest consumer of energy, although the demands of the transport sector are growing fast. Between 75% and 80% of China's electricity is generated by burning coal. Another 20% comes from large-scale hydropower projects, with most of the rest coming from nuclear stations. As yet, oil, natural gas and renewables such as wind barely feature in the electricity mix. But by 2020, according to official projections, gas fired stations could be meeting 15% of China's electricity needs, while nuclear power may have expanded to around 5%. And thanks to a law passed in February this year designed to promote renewable energy, wind and other renewables could account for 10%. However, with power demands poised to double over the same period, it's clear that a massive increase in coal consumption is unavoidable.

Sustaining economic growth is the leadership's priority, say seasoned China watchers, but it wants to achieve this without compromising energy security. China lacks substantial reserves of oil and natural gas, and is determined not to become heavily dependent on imports. But the country has coal in abundance. So it will use the fuel in ever-larger quantities, mainly to avoid a reliance on Russian oil and gas that could eventually bring the two powers to the brink of war.

But can China meet its energy needs without poisoning its environment and filling the lungs of millions of people with particulates and oxides of sulphur and nitrogen? The effects of acid rain are spreading, and there are suggestions that soot is already disrupting the regional climate (see 'Brown clouds cast a dark shadow', overleaf).



**Smog City: China's energy crisis is boasting interest in new technologies like coal liquefaction.**

Global climate change doesn't yet loom large in the thinking of China's leaders, but international experts note with alarm that coal is the worst offender in terms of CO2 emissions. "The global problem is climate. But for China, conventional pollution is the main problem," says Li Zheng, who directs the Tsinghua-BP Clean Energy Research and Education Centre, a collaboration between Beijing's leading scientific university and the British energy firm.

### **Efficiency drive**

China's energy planners have realized that improving energy efficiency is the easiest way to promote economic growth while controlling pollution. "China should work first on this," says Dadi. Predictions that assume 'business-as-usual' suggest that total energy demands will rise to the equivalent of 3.5 billion tonnes of coal per year by 2020. But introducing a suite of measures to improve efficiency could keep that below 3 billion tonnes, says Dadi. "Technically, it's do-able."

This new drive for efficiency stems in part from a quietly influential initiative run by the San Francisco-based Energy Foundation. Bankrolled for a total of US\$40 million since 1999 by the Hewlett and Packard foundations, the China Sustainable Energy Program is working with Chinese energy researchers to improve efficiency and cut pollution. Priorities include new efficiency standards for buildings, appliances and vehicles, and promoting renewable energy sources. Fuqiang Yang, who heads the Energy Foundation's Beijing office, points to recent successes such as the renewable energy law, plus fuel-efficiency standards and energy-efficient building codes adopted by central and local governments.

Energy efficiency is an admirable goal, but China's appetite for growth and the leadership's desire to limit imports of foreign oil mean it won't be enough. So China is embracing technologies that, in the West, remain on the fringes. Du Minghua, director of the Beijing Research Institute of Coal Chemistry, sees coal as an energy panacea, able to meet China's demands for electricity, liquid fuels and gas. "Coal is the solution for all three," he exclaims, before launching into a presentation on his institute's work on coal gasification and liquefaction.

Finding ways to reduce dependence on oil, critical for the transport sector, is the top priority for Minghua's institute. Young coals such as lignite can be converted



straight to liquid fuels by heating them to 450 C with hydrogen and a suitable catalyst, Minghua explains. Older coals such as anthracite must first be heated in oxygen to produce a mix of hydrogen and carbon monoxide known as syngas, which can then be converted into liquid fuels. Some of these can be blended with diesel and pumped straight into a conventional engine.

Despite Western experts' skepticism about the direct coal-to-liquid technology<sup>1</sup>, the state owned Shenhua Group is now building the world's first commercial direct coal-liquefaction plant in Inner Mongolia, scheduled for completion by 2008. And China is also in discussions with the South African company Sasol about the possibility of building two large indirect liquefaction plants.



### Brown Clouds Cast a Dark Shadow

China's flood season officially started this month with destructive floods in many parts of the country. In the past 20 years it has seen increasing summer floods in the south and drought in the north. The likely culprit is air pollution and, as this escalates with China's rapid industrial growth, it could alter weather across the region. The key player in China's climate woes is the blanket of aerosol particles that hover over Asia. China isn't alone in creating this pollution hazard. India is a major contributor to the brown clouds of smog — mostly black carbon, organic carbon and other aerosols such as sulphates and nitrates — formed by wildfires and by burning fossil fuels and biofuels.

Black carbon, a sooty byproduct of coal burning, absorbs sunlight, resulting in a hotter atmosphere and cooler ground. Sooty particles also affect rainfall by seeding smaller droplets and preventing the formation of larger droplets. This aids cloud formation, but reduces the amount of rain produced. To simulate the observed changes in China's rainfall patterns in recent decades, a team led by Surabi Menon of the NASA Goddard Institute for Space Studies in New York used a global climate model that factored in black-carbon emissions<sup>4</sup>. But although climatologists generally agree that aerosol pollution has altered China's rainfall, they remain cautious

about its potential regional impact. "We are dealing with imperfect measurements and imperfect models," says George Carmichael of the University of Iowa. Reliable measurements of aerosol emissions are lacking, particularly for black carbon. And climate models are riddled with uncertainties, for example how aerosols modify clouds.

Even so, studies reveal a similar picture elsewhere. Simulations by Veerabhadran Ramanathan from the Scripps Institution of Oceanography in La Jolla, California, and colleagues show that aerosol pollution caused changes over the north Indian Ocean that resulted in decreased monsoon rainfall and increased drought in India<sup>5</sup>. Similarly, China's pollution could affect surrounding oceans, altering monsoon rainfall across the region, says Ramanathan. The next step is to reduce some of the uncertainties. Project Atmospheric Brown Clouds, run by the United Nations Environment Programme, began monitoring Asia's smog earlier this year. And improvements in satellite measurements of aerosols, together with China's plans to increase emission monitoring, will help determine the extent and impact of the country's air pollution.

Carina Dennis

### Crude substitute

Neither process is a model of efficiency, however. Direct liquefaction is about 60% energy efficient, indirect techniques around 45%. But China's desire to seek alternative liquid fuels is so great that Minghua estimates that liquefaction technologies could be providing it with more than 50 million tonnes of fuel per year by 2020. "This is a personal estimate," he stresses — but one that will be music to the ears of China's leaders. If Minghua is correct, coal liquefaction could reduce China's demand for crude by 100 million tonnes per year, or about one-third of its anticipated imports 2020.

Coal is also central to the thinking of researchers at the Tsinghua-BP centre. Zheng is focusing on a strategy called polygeneration in which a single plant would convert coal into syngas, then use it in gas turbines to generate electricity and also convert it into liquid fuels<sup>2</sup>. Sulphur is removed as an integral part of gasification, cutting pollution. To demonstrate the technology's potential, Zheng and his colleagues have conducted a 'syngas city' simulation for Zaozhuang in the eastern Shandong Province. Like many industrial centres in China, Zaozhuang faces a major problem: how to continue growing when the only readily available fuel is high-sulphur coal.

In the 'syngas city' model, the Zaozhuang authorities would provide incentives to promote polygeneration,

which not only generates electricity but also produces methanol for vehicle fuel and dimethyl ether for domestic cooking and heating. The simulation suggests that polygeneration could meet more than a quarter of Zaozhuang's electricity needs by 2020. It would also achieve drastic cuts in sulphur dioxide emissions while reducing the need to invest in expensive flue-gas desulphurization technology at conventional power plants<sup>3</sup>. Further reductions in air pollutants, such as ozone-forming compounds, would come from the wider use of methanol and dimethyl ether.



Such simulations are the stock-in-trade of energy researchers worldwide. But in China there may be a greater chance of their being implemented, given the authorities' power to enforce their will. Preparations for the 2008 Beijing Olympics are a case in point. Realizing that the city's appalling air quality could damage athletes' health — and present a poor image of China to the world — the city is now engaged in a frantic clean-up, closing some 200 heavily polluting factories, piping in natural gas, and introducing a clean 'bus rapid transit' system. "The Olympics are a very big opportunity," says Li Hao, who heads Earth-View, a Beijing-based environmental group.

Zheng and his colleagues hope that growing official concerns about environmental health will also boost their proposal to build a polygeneration demonstration plant, costing some 5 billion yuan (US\$600 million), which would generate up to 400 megawatts of electricity and produce as much as 400,000 tonnes of liquid fuel per year. "We got a very good response from the government," says Zheng.

### Greenhouse city

But while polygeneration and other clean-coal technologies may help to scrub China's filthy air, they

won't do much in the short term to limit the nation's growing greenhouse-gas emissions. According to Zheng's simulation, total CO<sub>2</sub> emissions from power plants would be higher for the syngas city than if Zaozhuang continues using conventional technologies<sup>3</sup>.

In the long run, however, polygeneration could provide a route to a more sustainable future, in which hydrogen is extracted from syngas and used to power fuel cells, while CO<sub>2</sub> is captured and sequestered. "But to get there, the investment will be huge," warns Zheng.

Given the costs involved, experts say that China's interest in carbon sequestration will depend largely on the willingness of Europe, North America and Japan to pay for it. Those who work in the energy industry are blunt about China's determination to strike a hard bargain. If the necessary cash isn't forthcoming, they say, all deals are off.

China's potential to single-handedly emit enough CO<sub>2</sub> to negate all other nations' efforts to control their greenhouse-gas emissions could place its leaders in a strong negotiating position. "If it's business as usual, then the planet is dead," says David Moskowitz, director of the Regulatory Assistance Project, based in Gardiner, Maine, who is advising Chinese officials on reforming the electricity-generation sector.

That should provide food for thought for the leaders of the G8 wealthy nations, who meet in Scotland in July with global warming on their agenda. China is a signatory to the Kyoto Protocol on climate change, but as a developing country it doesn't yet have an emissions reduction target. Whatever strategy world leaders contrive to save the planet, China will sooner or later have to be brought on board. And that won't come cheap.

*Peter Aldhous is Nature's chief news and features editor.*

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# The New York Times

ON THE WEB

## China Preparing to Tax Vehicles With Large Engines

By Keith Bradsher  
August 26, 2005

HONG KONG - Alarmed by high world oil prices and sporadic shortages of gasoline and diesel fuel in big cities this summer, China's leaders are drafting plans to impose steep taxes on cars and sport utility vehicles with gas-guzzling engines.

The taxes would add as much as 27 percent to the price of vehicles with big engines, notably sports cars and S.U.V.'s, auto industry officials and people advising the government on the plan said. At the same time, taxes may be cut slightly for models with the smallest, most efficient engines, though the details of these cuts are still under discussion, they said.

The taxes follow China's adoption on July 1 of fuel economy standards that are more stringent than those in force in the United States. The Bush administration announced plans on Tuesday to phase in tougher fuel economy rules for light-duty trucks in the 2008-11 model years, but the Chinese have already imposed stiffer standards to take effect in 2008-9.

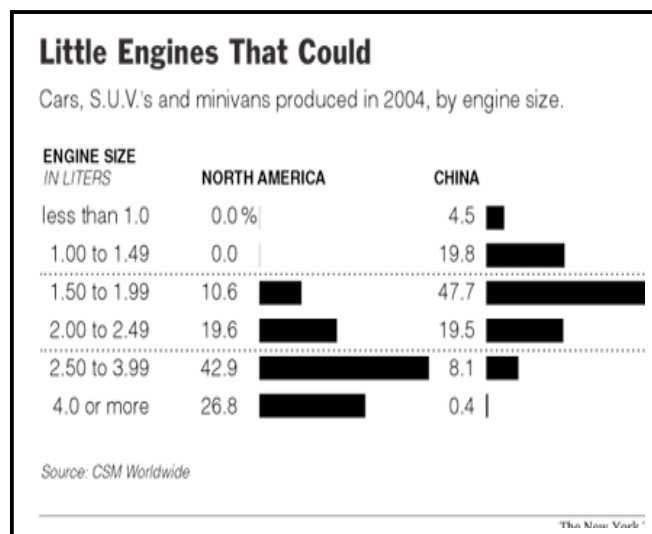
Since the 1970's, the United States has had a so-called gas-guzzler tax up to \$7,700 on cars that get very low gasoline mileage. The tax falls mainly on sports cars with huge engines, like Ferraris, because S.U.V.'s, pickup trucks and minivans are exempt from the tax - an exception that has contributed to a shift away from cars and toward these trucklike vehicles in the American market.

The planned taxes in China are part of a much broader effort to improve the nation's energy security. Efforts by state-controlled oil companies to buy foreign businesses have drawn the most attention, particularly Cnooc's unsuccessful \$18.5 billion bid this summer for Unocal, and China National Petroleum's \$4.18 billion deal on Monday to buy PetroKazakhstan.

But China has also been focusing on energy efficiency. Zhang Guobao, vice minister of the State Development

and Reform Commission, said last week that China's next five-year plan, for 2006 through 2010, would put energy conservation ahead of expanding supplies, the official New China News Agency said.

The State Council, or cabinet, is in the final stages of drafting the new automobile taxes, a complex process involving many government agencies, said He Dongquan, the transportation program official in the Beijing office of the Energy Foundation, a nonprofit group that has worked with the government on the issue. "I'm quite sure it will be adopted in the next one or two months," he said.



Feng Fei, director of the industry department at the State Council's Development and Research Center, said in June that his agency had submitted a plan calling for steep increases in excise taxes from automakers on vehicles with big engines that burn more gasoline, The China Daily reported then.

"The taxation change is mainly aimed at encouraging car owners to consume less oil and at cushioning environmental pressures," Mr. Feng said in June. A call to his office on Thursday was not answered.

With rising gasoline prices already pushing consumers toward more fuel-efficient models, auto manufacturers appear to be offering little resistance to the planned new tax.

"The move is consistent with energy conservation plans, and we believe it is the right way to go in achieving energy efficiency in society," said Li Fengzhen, chief

financial controller of Great Wall Automobile Holding, a manufacturer of medium-size S.U.V.'s that would face slightly higher taxes under the plan.

China currently imposes an excise tax of 3 percent, 5 percent or 8 percent on cars - those with larger engines pay higher rates - while taxes on S.U.V.'s and minivans are 3 percent or 5 percent. Under the new rules nearing completion, the taxes would range from 1 or 2 percent for vehicles with the smallest engines to 20 percent for vehicles with engines of four liters or more, said An Feng, director of the Auto Project on Energy and Climate Change. That group is a nongovernmental organization in Beijing that has advised officials on fuel economy policy, though it has not been directly involved in drafting the new tax regulations.



(While a four-liter engine is considered quite large in most of the world, it is typical for an American sport utility vehicle. For example, the standard six-cylinder engine of the Ford Explorer, the best-selling S.U.V. in the United States, displaces 4 liters, though a larger 8-cylinder, 4.6-liter engine is available.)

In addition, the Chinese government has been working on a gas-guzzler tax similar to the American tax but covering S.U.V.'s and minivans in addition to cars, Mr. An said. Mr. He of the Energy Foundation said that the tax would vary from 5 percent to 15 percent, depending on engine size, and would apply to vehicles that fell short of the fuel economy standards imposed on July 1.

Chinese vehicle taxes largely exclude pickup trucks, which are separately regulated and sell in tiny numbers. Minivans in China tend to have medium or small engines and may not face much of a tax increase.

The track record of gas-guzzler taxes on vehicles in promoting energy efficiency has been mixed in other

countries, said Paul Blokland, director of Segment Y, a consulting firm in Bangalore, India, that tracks automakers in Asia. Very affluent consumers who can afford big vehicles with large engines tend not to be discouraged by extra taxes on the initial price of the vehicle, he said.

Yale Zhang, an analyst in the Shanghai office of CSM Worldwide, a global automotive consulting firm, said that most Chinese buyers, unlike Americans, already chose vehicles with smaller engines. So increased taxes will fall on just a small share of the market.

The multinational company that may face the biggest burden from the taxes is likely to be DaimlerChrysler, which sells Jeeps and big Mercedes sedans in China. Grand Cherokees with 4-liter and 4.7-liter engines, not especially large by American standards, would fall in the highest category of excise taxes. Trevor Hale, a DaimlerChrysler spokesman in Beijing, said the automaker had not seen the details but supported the government's general desire to improve fuel economy.

Chinese officials had talked earlier this year of imposing a fuel tax once world oil prices started to decline, so as to hold domestic gasoline and diesel fuel prices at whatever peak they might reach. High prices would then encourage long-term attention to efficiency, the officials reasoned. But they have lately been silent on the matter of a fuel tax, having had to cope with dissatisfaction from taxi drivers in particular over fuel price increases that have already occurred.

The government-regulated retail price for gasoline in China has risen to \$1.73 a gallon this month from \$1.29 a gallon two years ago, an increase that has lagged behind the steep climb in global crude oil prices.

Many service stations in southeastern China ran out of gasoline and diesel fuel a week ago, shortages the government attributed to shipping disruptions resulting from a passing typhoon and a tropical storm.

But shipping executives said that the storms had no effect on deliveries by tankers. China's main refiner, Sinopec, has blamed hoarding for the shortages, as businesses and drivers keep an eye on oil prices and top up tanks now in anticipation that Chinese retail prices, adjusted only once a month, will rise next month.



## High-speed City Buses to Tackle China's Congestion

BEIJING, Sept. 5, 2005 (Reuters) - China plans to build networks of high-speed city buses to tackle congestion and soaring demand for oil, a senior transport official said on Monday.

The Bus Rapid Transport (BRT) networks, partly inspired by underground train systems, will use exclusive lanes with customers likely required to buy tickets before they climb aboard to save time, said Zhao Jie, vice-director of the Urban Transport Centre at the Ministry of Construction.

"We hope that as metro networks take so long to build, [BRT networks] can help solve the public transport situation," he told Reuters on the sidelines of a conference organised by UK-based think-tank Chatham House and the China Institute of International Studies.

Bumper to bumper traffic means traveling just a couple of kilometres during rush-hour can take over an hour in Beijing.

Gridlocked cars burn 7 to 10 percent more fuel than in smooth-flowing traffic, Shi Baolin, Vice President of the China Academy of Transportation Sciences, told the conference.

With China already dependent on imports for over 40 percent of its crude needs, and car ownership soaring, the amount of fuel burnt by private drivers is an increasing concern.

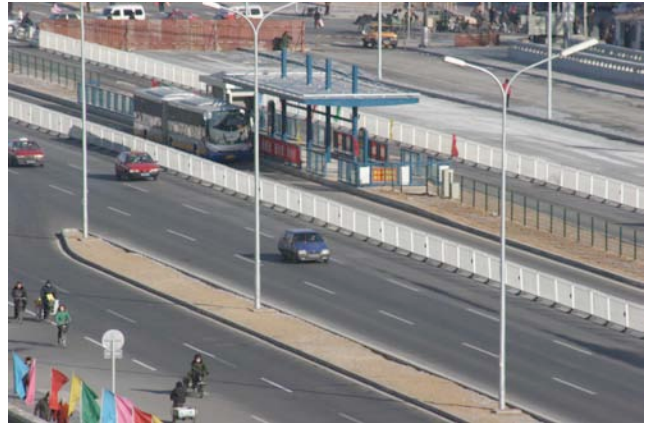
Zhang Weiping, Deputy Chief Economist with oil firm CNOOC called for more flexible working hours to combat the traffic snarls on the country's city roads.

The BRT buses, most with room for around 100 people, will have stops spaced an average kilometre apart, compared with just 400-500 metres on ordinary routes, Zhao said.

As buses use modified lanes on existing roads, investment is usually low. City authorities pay for the new systems, with pioneers including tourist hotspot Hangzhou.

Ticket prices will likely be a modest 1 to 1.5 yuan (\$0.124-\$0.186) higher than on ordinary routes, and if the first BRT experiments in 7 or 8 cities are successful, the government hopes to roll the system out across the country, Zhao said.

Six lines are planned for the capital Beijing, with the first one already in a trial phase and expected to be fully up and running before the end of the year, he added.



**Beijing's new Bus Rapid Transit corridor connects to the subway at the southern end of Tiananmen Square, running south through Qianmen.**