The China Sustainable Energy Program
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CHINA PROGRAM UPDATE & CLIPPINGS

Issue 20 **June 2006**

Message from the Director:

The environmental costs of China's rapid economic growth continue to mount. China's leaders have set an ambitious target—the economy is to become 20 percent more energy efficient by 2010—in order to cut emissions nationwide. To implement the target, the National Development and Reform Commission (NDRC) is requiring industrial efficiency targets in all major industries, building codes for all new commercial and residential construction, and other policies and measures described in this newsletter.

Industrial energy efficiency targets are a core strategy of China's central government for getting the nation's energy system back in balance. Between 1980 and 2000, China succeeded in improving energy intensity (the amount of energy per unit GDP) over 4 percent per year. But since 2001, China has flipped this historic trend—energy is now growing 1.2 times faster than GDP. The 2010 target aims to get China back on track. The most energy wasteful economic sector is industry: the 1,000 largest industrial enterprises consume over one-third of China's primary energy. These enterprises are now participating in the "Top-1,000 Enterprise Program," modeled after the successful Shandong Province pilot where grantees (including Lawrence Berkeley National Lab) developed efficiency targets for two large steel companies. A recent tour of the Jigang steel plant in Jinan revealed an advanced cogeneration unit in the heart of the plant that is helping the company reap enormous energy savings, reach its efficiency target ahead of schedule, and collect a significant profit. Grantees are committed to scaling up the efficiency targets approach in the months and years ahead.

Building codes are rapidly progressing; our grantees are focusing in Central and South China, China's largest population zone. The new codes, adopted nationwide by the Ministry of Construction for all new commercial and residential construction, are state-of-the-art, co-developed by Chinese grantees and the Lawrence Berkeley National Lab. The six local pilots (Fuzhou, Xiamen, Shenzhen, Guangzhou, Shanghai, Chongqing) are progressing better than anticipated; each city is implementing robust administrative procedures to assure local compliance. Harder is local availability of energy efficient building materials. All local areas are experimenting with various insulation products manufactured locally, installing double-pane glazed windows, and putting solar hot-water systems on building roofs. Importing energy efficiency products and technologies from abroad is expensive; China's challenge continues to be localization of best practice policies and technologies.

Best regards,

Doug Ogden

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Program Updates—June 2006

Renewable Energy

NDRC is preparing another batch of **wind concession projects totaling 700 MW** and will issue requests for tendering during the summer, 2006. To date, 1,150 MW of wind concession projects have been tendered; these new projects will bring the total to 1,850 MW. Once on-line, these projects are expected to reduce CO_2 emissions by 3.6 million tons annually.

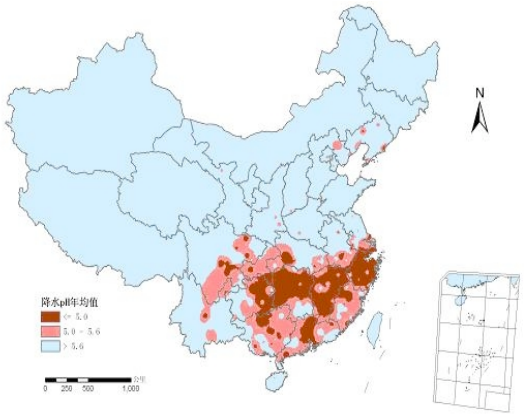
In February, the National Development and Reform Commission (NDRC) awarded **three concession contracts in coastal Jiangsu province** for the development of 200 MW of wind farms. These projects were awarded without a public bidding process, and instead encouraged a feed-in tariff approach as originally envisioned in the Renewable Energy Law. On January 1st, NDRC had issued wind tariff regulations that would require wind contracts to be awarded in a competitive bidding process. Such a model would likely primarily benefit large utility-affiliated wind power developers, and may not provide the needed profitability and market stability for robust market growth. In February, however, the National Development and Reform Commission (NDRC) awarded three concession contracts in coastal Jiangsu province for the development of 200 MW of wind farms. These projects were awarded without a competitive bidding process. The granting of these projects without competitive bidding may reflect NDRC's reconsideration of its previous bidding policy and encourage a reversion to the feed-in tariff approach.

Electric Utilities

NDRC announced an **Energy Efficiency Power Plant (EPP) pilot** project in Guangdong Province. An idea conceived and developed by grantees including the Regulatory Assistance Project (RAP) and Natural Resources Defense Council (NRDC), EPPs are bundled energy efficiency projects designed to deliver the energy and capacity equivalent of large conventional power plants. Rather than adding new capacity and generating more electricity, utilities invest in energy saving technologies that offset the equivalent amount of energy as a new power plant would produce. The Asian Development Bank has offered to finance the implementation of the EPP project and CSEP will support capacity building for the team responsible for implementing the project.

In an effort to improve generation efficiency and reduce pollution, NDRC and seven other government agencies issued a notice in April requiring by 2010 the **closure of 17,000 MW of small (<50 MW) coal-fired power plants** and 7,000 MW of oil-fired power plants. Plants on the closure list will be denied grid access and fuel supply.

SEPA signed **SO_2 emissions reduction contracts** with China's major power generating companies and 7 provinces located in the two acid rain control zones (South and Central China). The contracts specified reduction targets, responsibilities, and specific measures to be taken by all parties. In the 11th Five-year Plan for



Acid Rain Control Zones

Environmental Protection, SEPA adopted a total emissions cap requiring 10-percent reductions in major pollutants and used a "generation performance standards" (GPS) approach to allocate emissions allowances to provinces. The power sector is singled out to apply a separate allocation scheme; the signing of these contracts solidifies these arrangements.

Two companies, the Dongfang Chemical and Electricity Co., and GreenGen LLC, announced plans to build **integrated gasification combined cycle (IGCC)** facilities. Dongfang, based in Guangdong, faces local environmental protection bureau (EPB) regulations that bar construction of traditional combustion coal plants due to the local acid rain controls. Local enterprises in the Pearl River Delta are allowed to build only three kinds of power plants: nuclear, liquefied natural gas (LNG), or IGCC. Dongfang plans to complete two plants, a 120-MW pilot and an 800-MW commercial plant over the next two years.

Buildings

In his annual report to the National People's Congress, Premier Wen Jiabao announced that the government will prioritize the building of "energy-efficient and land-saving buildings."

Pending before the State Council is a provision requiring **all new residential and commercial construction to comply with building energy codes**. In May 2006, the Ministry of Construction completed the *Management Provision of Building Energy Efficiency* and submitted it to State Council. The Provision requires all provincial and municipal governments to adopt administrative procedures to monitor construction and insure codes implementation. State Council approval is expected by the end of this year.

In April 2006, the Ministry of Finance and NDRC accepted grantee recommendations for new **investment tax credits** to promote energy-efficient building materials and equipment. Enterprises will be allowed to deduct their investments in more efficient process manufacturing, equipment, and building materials products. State Council approval of the tax credits is expected by year-end.

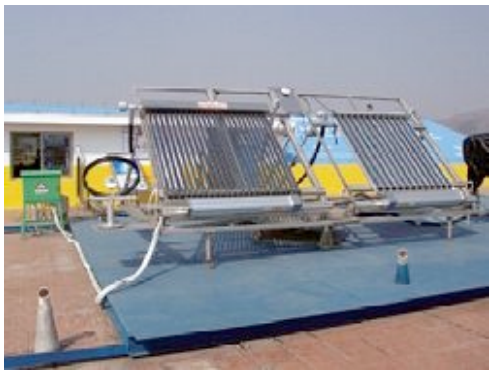
One of our building codes pilot cities, Chongqing, established regulations for **code implementation and building inspection**, with Shenzhen on track to adopt later this year.

The Ministry of Finance (MOF) renewed China's **New Wall Material Innovation Fund**, which helps finance efficient building materials development and that was originally scheduled to end in 2005.

The world's first **television energy efficiency standard** regulating both active and standby power usage (power consumed even when TVs are switched off) went into effect in China on March 1st. The standard could cut China's annual carbon dioxide emissions by 24 million tons in 2020.

In February, NDRC approved **energy information labels** for two new products, washing machines and residential central air-conditioners.

The China National Institute of Standardization submitted a **gas water heater standard** to the State Administration of Standardization in January. The proposed standard could reduce gas water heater energy usage by four percent, reducing carbon dioxide emissions by 2.5 million tons over the next ten years.



Between 30 and 40 million families have solar water heaters on their rooftops, which by 2010 will save China from burning 22.5 million tons of coal.

Industry

NDRC issued the ***Top-1000 Enterprises Implementation Plan*** on April 7th, 2006. China's largest 1,000 enterprises consume a third of the nation's primary energy. The "Top-1,000 Enterprises" energy efficiency program aims to cut 100 million tons of coal equivalent in five years, and reduce 242 million tons of carbon dioxide. NDRC held a workshop on June 2, 2006 with associations of the nine key industrial sectors to discuss implementation details. NDRC plans to hold five regional meetings covering 20 provinces to develop local implementation measures. Support is growing for this Top-1000 program to be modeled after the successful U.K. Climate Change Levy (CCL) and Climate Change Agreements (CCA) Programs, which together levy an energy-consumption tax that is 80

percent refunded if enterprises voluntarily meet emissions reduction targets. The U.K.'s Department of Environment, Food, and Rural Affairs and Lawrence Berkeley National Lab are actively providing guidance to the Top-1000 program.

Top-1,000 Enterprises Energy Efficiency Program Implementation Planning Meeting

Transportation

On April 1st, a **new vehicle excise tax scheme for passenger vehicles** went into effect, with a sliding tax scale depending on engine size. The policy is aimed at shifting China's vehicle market toward smaller, more fuel-efficient, and lower-polluting vehicles.
The Toyota Prius, produced in Changchun through a joint venture between Toyota and China's First Automobile Works, became the **first hybrid passenger vehicle** certificated to be produced and sold in China. Dongfeng Motor Corporation's EQ6110HEV model became the first hybrid bus model certified.

NDRC's Vehicle Standardization Technical Committee approved **new light-duty commercial truck fuel efficiency standards.** The proposal is now going through government procedural formalities; official adoption in expected in 3-6 months.

With pressure from SEPA and our grantees, China's oil industry has proposed to revise the current **gasoline fuel quality standard** to adopt 150-ppm sulfur content in gasoline nationally by 2009-2010. The proposal, however, falls short of the need to harmonize with China's vehicle emissions reduction goals. Grantees continue to push for a more comprehensive fuels desulphurization program.

Beijing's BRT Corridor

Hangzhou's New BRT Corridor

Hangzhou, the capital of Zhejiang Province, opened a **bus rapid transit (BRT) system** on April 1, 2006. The system is running well with 50,000 daily passenger trips. **Jinan**, the capital of Shandong Province, launched construction of its first BRT corridor, slated to begin operations by the end of 2007.

Low-Carbon Development Paths

Two-thirds of China's **provinces have announced commitments for meeting the national 2010 20-percent energy intensity improvement target**. However, no province has yet developed implementation plans. There are signs of progress, however: last month, a grantee report recommending specific sustainable energy policy steps for implementing the 20 percent target drew praise from the State Council.

Workshop Updates

Dialogue Partner Meeting

CSEP benefits from ongoing advice from a group of 25 directors-general who oversee implementation of China's energy and environmental policies. Our most recent Dialogue Partners meeting was held June 23-25 in Beijing. Topics included: Local implementation plans for the national 2010 20-percent energy intensity improvement target; mechanisms for getting electric utilities into the energy savings business, rather than solely the electricity supply business; coal gasification with carbon capture and sequestration

Fuel Tax Research Project Conference

On February 17th, the Ministry of Finance (MOF) hosted a conference launching a fuel tax project. The conference gathered all parties that will be involved in its development and those who will be affected by the tax: officials from MOF, NDRC, the Ministry of Communications, and the State Environmental Protection Administration; researchers from the China Automotive Technology and Research Center, Tsinghua University, and Renmin University; and representatives from the petrochemical and automobile industries all attended the conference.

A follow-up conference was held July 5-6 in Beijing, focusing not only on the impacts of higher fuels prices from a proposed tax, but also on uses of the proposed tax. For example, the equivalent of a U.S. 4-cent gas tax could retrofit all China's gasoline and diesel refineries to produce low sulfur (under 50 ppm) fuels, with enormous public health and environmental benefits.

Workshop on the Early Adoption of an Air Conditioning Energy Efficiency Standard in Shanghai

In 2005, the Shanghai Energy Conservation Supervision Center (SECSC) developed a plan for Shanghai to adopt China's new national air conditioner energy efficiency standard and label ahead of the national schedule. The Shanghai Municipal Government supported their plan and incorporated it into Shanghai's *11th Five-year Energy Conservation Plan*.

On December 12, 2005, SECSC held a conference to launch the implementation phase of the project. Conference participants agreed that the early implementation of the air conditioning energy efficiency standard in Shanghai is feasible—manufacturers have the technological capacity to improve their products' energy efficiency—and desirable—implementing the standard early in Shanghai will facilitate the subsequent nationwide implementation of the standard; help China and Shanghai reach their energy savings goals; increase the market share of Shanghai-produced air conditioners in both domestic and international markets; and promote the development of energy efficient technology in China. SECSC will work throughout 2006 to secure the early implementation of this standard in Shanghai.

Energy Label Implementation Conference

NDRC's Department of Environment and Resources Conservation and the State Administration of Quality Supervision, Inspection, and Quarantine's Department of Policy and Legislation held a conference on the implementation of China's energy labeling program on March 1st in Beijing. In its first year, the program was enormously successful, responsible for saving an estimated 1.78 billion kWh. There is still room for improvement; this conference focused on how to design and implement a system to supervise the use of the labels to ensure that products using the label actually meet its energy efficiency requirements.

Workshop on the Development of an Energy Efficiency Standard for Fresh Water Centrifugal Pumps

The China National Standardization Technical Committee for Energy Basis and Management has been developing an energy efficiency standard for fresh water centrifugal pumps; on March 3-4th, they held a workshop gathering domestic energy efficiency experts, representatives from the pump industry and pump product testing centers, and international experts from the U.S. and Switzerland to discuss their draft standard. The meeting participants reached a consensus regarding the energy efficiency levels that should be required for fresh water centrifugal pumps. The draft standard should be circulated nationwide in May, before its finalization and submission for national approval later on this year. The new standard should stimulate new research and development in the pump market, improve the competitiveness of China's fresh water centrifugal pumps, and save energy.

Reporters' Sustainable Energy Forum

A Reporters' Sustainable Energy Forum was held on January 20 to educate reporters about the content of China's new *Renewable Energy Law* (RE Law) and its implications for renewable energy development. This was the second forum held to educate reporters on the RE Law; the first, of a more introductory nature, was held on March 4, 2005. Mr. Wang Zhongying, head of NDRC's Renewable Energy Development Center, introduced the Law, described how it will be implemented, and fielded questions from reporters. Dr. Shi Pengfei, deputy head of the Renewable Energy Association's Wind Energy Professional Committee, discussed the current state of wind energy development in China and explained how the power purchase price for wind energy will be determined. Mr. Chai Zhaowen, deputy head of the Development Department of Long Yuan Electric Power Group, discussed the impact the RE Law will likely have on investment in wind power projects in China.

News Update

WSJ.com THE WALL STREET JOURNAL. ONLINE

China Grapples With Energy Crisis

Struggle to Diversify From Coal Is Hampered By Soaring Gas Prices

By Shai Oster and Patrick Barta
March 3, 2006

China's decade long attempt to push natural gas instead of coal and oil is faltering amid skyrocketing gas prices. The country's struggle to diversify its energy use could further damage its already degraded environment and put renewed pressure on international oil prices.

Tongchuan, a city of 800,000 in central China, built a natural-gas distribution system in the late 1990s to combat its reliance on coal and battle smog created by its local cement factories. The pollution was so bad that Tongchuan couldn't be seen on satellite images, prompting China's then-leader to dub it "the invisible city."

Moving coal in Tongchuan

Despite a significant improvement in Tongchuan's air quality, local leaders are planning a new plant and it is going to be powered by coal. They blame sharply rising gas prices. "We have plenty of coal, why don't we use it?" says Zhao Guanlong, the deputy director of the city's development and planning commission.

China has backed out of at least one multibillion-dollar deal to buy gas from overseas oil companies and other deals are in jeopardy. Plans to build more than a dozen terminals to receive gas shipments are on hold. Chinese officials are discouraging new gas-related investments because they fear the terminals won't be fully utilized.

Meanwhile, in the 18 months through July 2005, the government approved 168 power plants, nearly all of which are coal-fired. In the past year, China has built enough coal-fired power plants to provide electricity to all of Italy, all but ensuring coal will remain a dominant fuel for decades.

If China's gas push had been more successful, it would have reduced the strain China places on world oil markets. China is currently the world's second-largest consumer of energy, after the U.S., and its needs are only growing as the economy expands.

In 2004, Chinese oil imports surged 15% after electricity supplies ran low, a move that caught energy markets by surprise and underpinned the biggest jump in oil prices in a generation to more than $55 a barrel. With a more diverse energy portfolio, China wouldn't have needed to rely so heavily on oil. The current international price of around $63 a barrel is in part due to Chinese demand.

Today, only 2.1% of China's power plants run on natural gas, up from nearly none a few years ago. All things considered, gas can be a more expensive alternative than coal and oil, in part because of the high costs associated with transporting it. Because of these kinds of expenses, years. Having been locked out of some recent import deals, China could find it hard to get back on the gas bandwagon anytime soon. China's planners predict the country will have to import around half of its natural gas by 2020.

China also faces challenges developing nuclear power. The price of uranium, a key ingredient, has quadrupled since 2002, partly on expectations of Chinese demand. Chinese planners are proceeding with plans to build about 30 nuclear power plants in the next 15 years. The country currently operates nine reactors.

Chinese policy makers say there hasn't been a change of policy toward natural gas. Last month, the government reiterated plans to promote alternative sources of energy, including gas, nuclear power and hydropower.

But officials acknowledge that the market is thwarting

Chinese companies from locking in supplies. "The fate of [natural-gas] projects lie with the changes of the international [natural-gas] market," says Hu Weiping, head of the oil and gas division of the National Development and Reform Commission, one of China's most powerful planning agencies. "The main problem is that Chinese companies haven't come to an agreement with international suppliers."

China started worrying about its energy policy in 1993 when it became a net oil importer for the first time. At the same time, the environmental havoc caused by the country's rapid industrialization was becoming a sensitive issue on the international scene and also among China's citizens. The government worried that a rise in pollution-related diseases and the general condition of its cities could become a source of popular unrest.

Natural gas seemed promising. It can be used to run power plants and heavy industry, two of the country's biggest energy users, and also home heating and cooking. Unlike oil, it is widely available in Asia, with untapped fields across the region, including Western China. Natural gas burns more efficiently and cleanly than coal, offering more energy at lower environmental cost.

Cities such as Shanghai and Beijing began digging up streets to lay pipeline networks to bring gas to every home. The central government laid plans for gas-fired power plants and a countrywide network of pipes. To receive imports in the form of liquefied natural gas, or LNG, China's state-owned oil companies announced plans to build about 20 terminals. The government predicted it would import as much as 50 million metric tons of LNG a year by 2015. Analysts think 2005 world-wide LNG consumption was between 140 million and 150 million tons.

Chinese oil companies began negotiating contracts to buy gas from countries including Australia, Indonesia and Iran. In one such deal, China National Offshore Oil Corp., also known as Cnooc, agreed to a 25-year, $13 billion contract to buy LNG from a consortium of companies that control the North West Shelf, a large Australian gas project. Cnooc later agreed to buy billions of dollars of gas from another Australian project, the Gorgon field, which had been waiting for a buyer since its discovery in 1981.

China's early deals priced LNG at about $3 per million BTUs, or British Thermal Units, the scale used for gas sales. Since then, prices have more than doubled as countries such as the U.S. have stepped up natural-gas imports to replace oil.

Foreign firms can pay those prices because they can pass on cost increases to consumers. But in China, regulators have placed caps on the retail price of electricity and other fuels. Power companies, the primary customers for natural gas, can't pay market rates and make a decent profit.

Faced with an uncertain market, Chinese oil and gas companies began to rethink foreign gas deals. Cnooc walked away late last year from the Gorgon field after it couldn't agree on a price with the field's owners, led by Chevron Corp. of San Ramon, California. Chevron instead found three Japanese utilities to buy the gas instead, including Osaka Gas Co., which signed a 25-year contract valued at an estimated $7.5 billion.

"When we signed the China deal, the LNG market was really a lot different," says Audie Setters, vice president of Chevron's LNG Marketing and Trading group in Houston. "To some extent, the market overtook them."

As China fails to secure supplies, its gas-fired power plants are facing shortages. About four gigawatts of power -- roughly 40% of China's total gas-fired power plant capacity -- has been closed this year due to lack of gas, according to China Daily, a state-run English language newspaper. Hong Kong utility Meiya Power Co. just scrapped plans to build a gas-fired power plant in China because of uncertainties over supplies.

China "is just not in the market for any more gas," says Jonathan Stern, director of gas research at the U.K.'s Oxford Institute for Energy Studies. "As soon as the price got expensive, China dropped out."

China's three major oil companies remain optimistic that the country's gas business will take off and say they intend to build more terminals. Officials at Cnooc are expecting the first LNG cargo to arrive this spring in the country's first LNG terminal in Guangdong -- a joint venture of Cnooc and the U.K.'s BP PLC. They say they are proceeding with several new terminals including one in Shanghai, though they don't yet have final government approval for that project.

Some Chinese companies are looking for alternative

supplies, perhaps from Russia or Kazakhstan. At the same time, the government says it may consider raising the cap on gas prices to help power companies and squelch some demand.

Back in Tongchuan, local officials would love to promote more gas -- but they aren't sure the economics make sense.

Tongchuan, which means Copper River, looks like it was slashed into the yellow earth of China's Loess Plateau. The city huddles at the bottom of a steep valley and is ringed by worn terraces pocked by cave dwellings some locals still inhabit. Despite the poor-looking soil, the city is relatively prosperous, with streets lined with fancy, neon-decorated restaurants and packed with cars and pedestrians.

The area is best known for a handful of agricultural products including apples, garlic and hot pepper, as well as fatal coal-mining accidents. In 2004, 166 miners were killed in a gas explosion caused by poor ventilation.

For years, coal kept Tongchuan's cement factories running and made it one of China's dirtiest cities. Thousands of smokestacks belched smoke that covered the town in a layer of ash. On winter days, a thick haze enveloped the city. Residents wouldn't wear white clothes for fear they would be stained black. Contributing to the pollution were thousands of domestic coal fires used for cooking, which made the fog worse during breakfast and dinner.

Keeping ash out of the food and controlling the high flames essential to much Chinese cooking was a problem. Zhang Yingchang, a retired bus-company employee, says cooking at home required two people: one to cook and another to stoke the fire. And "what if you forgot to bring the coal from downstairs?" she says. A lot of people became ill, she recalls, including her children.

In 1997, the Asian Development Bank offered a loan of $156 million for natural gas and other environmental projects to aid Beijing's energy diversification policy. In Tongchuan, the money helped pay for a 70-kilometer spider web of pipes connecting gas supplies to 30,000 households. Gas came through new pipes from a Chinese field 500 kilometers away.

Locals quickly embraced the gas network and air quality improved. Sulfur emissions have more than halved. More than two-thirds of the year now qualifies for what locals call "blue days," or days that are smog-free.

Ms. Zhang, who local officials produced to praise the benefits of natural gas, says she now has her own hot-water shower. Although gas is more expensive than coal, the health benefits are worth it, she says.

But gas demand wasn't as strong as planners had hoped. Some industrial users, such as big, state-owned cement factories, couldn't afford it. The gas-storage tanks perched on a hill above Tongchuan are only one-third full, an indication demand is running below capacity. Tongchuan Natural Gas Co., the company set up to run the city's gas operations, continues to need government subsidies to repay its ADB loan.

The city is trying to attract food-processing companies that use gas in industrial processes and is even considering setting up a network of vehicles powered by natural gas.

When weighing options for their next power plant, the city opted to stick with coal, which is inexpensive because it is abundant and easy to extract. The town intends to sell the electricity it generates to the regional power grid. "Natural gas is too expensive for power plants," says Mr. Zhao, the city planner.

THE NATIONAL ENGLISH LANGUAGE NEWSPAPER
CHINA DAILY

Energy intensity index deserves firm support

March 7, 2006

Talk of a fundamental change in the country's growth model is giving way to action, as for the first time China has introduced energy efficiency as a key measure of economic growth.

In his government work report delivered at the opening session of the National People's Congress (NPC) on Sunday, Premier Wen Jiabao proposed an about 4-per-cent reduction in energy intensity this year.

Energy intensity is an index measuring energy consumption per unit of gross domestic product (GDP).

It is a sound message that the country must bid farewell to extensive growth right now. Such a pattern of development has helped deliver rapid economic growth for more than two decades. But it has increasingly tested the limits of the country's energy and resource supplies in recent years.

The nation has agreed on the need for a new growth model that is more efficient in use of energy and resources. It is the only logical choice for a developing country with a population of 1.3 billion, the world largest, to sustain its economic progress and build itself into an overall well-off society.

However, it is not easy to put an end to the outdated growth model given the long-term heavy reliance on it by both officials overseeing economic growth and enterprises with low efficiency in energy consumption.

By making it a main target for the national economy to chop down energy intensity by 4 per cent in 2006 and by 20 per cent in the coming five years, the central government has fully demonstrated its resolve to take on the challenge of potential energy shortages.

When deputies to the NPC take time to examine the government work report and the 11th Five-Year (2006-10) Social and Economic Development Programme this week, they should not only heed traditional economic indices like GDP growth rate. The new gauge of economic performance in terms of energy consumption also demands their full attention.

Particularly, for local policy-makers among them, it is important to realign priorities of local economic growth with the energy-saving goal the central government has set.

According to interviews of some local officials attending the NPC, sweeping support for the introduction of the energy intensity index was accompanied by different perceptions of the challenge.

Worries by officials from less-developed areas are understandable. To narrow their gap with other rich regions, they must achieve faster economic growth. But the new requirement on reduction of energy intensity seemingly will make their catching-up efforts more difficult.

The central government is surely obliged to tilt public spending in favor of these areas.

Yet, more important, local governments should be far-sighted enough to see the cost of doing nothing, instead of doing something, to improve energy efficiency in view of the competitiveness of local economies.

Contrary to the gloomy view, complacency among some officials from wealthier provinces is more worrying.

The central government has laid down a cautious growth target of 8 per cent for 2006 just after the national economy soared by 9.9 per cent last year. This effort is obviously to leave local economies more room for maneuver in rendering themselves more energy efficient.

Better economic and financial conditions might make it possible for these regions to go through their work at pace this year. But that is no justification to make light of the problem.

The 4-per-cent reduction in energy intensity this year is an initial stab at addressing the country's low efficiency in energy use. And even the planned 20-per-cent reduction in the coming five years will only mount to a small step to narrow the huge energy efficiency gap between China and developed countries.

Relatively developed areas that used to consume more energy and resources should pursue higher energy efficiency to help realize the national goal. Taking the task lightly is not acceptable.

THE NATIONAL ENGLISH LANGUAGE NEWSPAPER
CHINA DAILY

Energy goals help 'cut global warming'

By Fu Jing
March 20, 2006

The country's commitment to reduce energy consumption and pollutant emissions was lauded yesterday by world-renowned economists and leading business executives, who said it would be a positive

contribution to cut down global warming.

They also called for China's global leadership in tackling climate change and other environmental woes as the country pursues sustainable development in the newly approved 11th Five-Year Plan (2006-10).

Referring to China's 2010 goal of cutting energy consumption per unit of GDP by a fifth from the 2005 figure, Nobel Laureate in Economics Joseph E. Stiglitz said that "it will be a contribution to the world" as it means less global-warming emissions.

"China's 11th Five-Year Plan seems to have taken this message to heart," Stiglitz told China Daily during an interview on the sidelines of a high-level forum on China's harmonious development organized by the China Development Research Foundation.
Stating that the scientific evidence on the threat of global warming and the link with greenhouse gas emissions is overwhelming, Stiglitz said China's commitment to increasing energy efficiency is "particularly commendable."

"But China should do more in terms of its new role of global leadership," said Stiglitz.

For example, he said, China could support the initiative of rainforest countries to curb deforestation within an expanded Kyoto Protocol as forests play an important role not only in avoiding global warming but also in preserving bio-diversity.

"China's plan to conserve resources will reduce timber imports; and it also can play a bigger role in helping developing countries with reforestation," said Stiglitz.

Among the important areas where that leadership needs to be exercised, the Columbia University professor said, is helping developing countries arrive at a common constructive platform on global warming.

Participants at the forum believe China's green goals provide business opportunities.

For instance, the government recently listed China's top 1,000 State-owned enterprises, which consume the lion's share of the energy used by industry, for potential savings.

"These goals mean business opportunities," said Mark Moody Stuart, chairman of Anglo American, a global mining giant.

The company is using new technology in Shaanxi Province which can slash carbon emissions by turning coal into gas and liquid fuel.

FT FINANCIAL TIMES .com

China launches tax to curb energy use

By Sun Yu
March 22, 2006

China will start imposing consumption taxes on heavy transport and jet oil, lubricants and naphtha, the finance ministry said on Wednesday, as part of its effort to increase the cost of energy and make its use more efficient.

The new taxes, to be applied on April 1, will include Rmb0.2 per litre for naphtha and lubricants, the same rate as for gasoline and Rmb0.1 per litre for heavy transport and jet oil.

China already has levied taxes on gasoline and diesel, two major kinds of fuel for vehicles, but revenues from these fees are set aside for road and highway construction.

Hu Yijian, a professor at the Shanghai University of Finance and Economics, says the new tax is part of the central government's drive to cut energy use.

The announcement may be the first in a series of government initiatives in coming months to lift energy prices for ordinary consumers using oil for their cars and heating.

The ministry has been preparing the imposition of a consumption tax for a number of years on standard petrol products, but has always held back for fear of a backlash from consumers and the possible impact on inflation.

The inclusion of more petrol products subject to taxes is aimed at "controlling the amount, and adjusting the

structure of energy consumption, and giving consumption taxes a larger role in managing the oil products market," the finance ministry said in a statement.

Heavy transport oil, for instance, is generally used to power ships and boilers. Yet customers had began to replace gasoline with fuel oil as it is equally efficient and remains yet to be taxed.

According to Mr Hu, taxing a wider range of products will prevent such fuel switching and help regulators to achieve more effective control of oil consumption. However, the government will only initially charge 30 per cent of the new tax and suspend the fee on jet fuel, citing its impact on domestic carriers' operations.

Despite several increases in prices and taxes in the past few years, Chinese drivers still pay far less than their overseas counterparts for energy, leading to rampant consumption of oil and a frequent shortfall of fuel in some major cities.

THE NATIONAL ENGLISH LANGUAGE NEWSPAPER
CHINA DAILY

Buyers of big cars have to pay more tax

By Yu Qiao
March 23, 2006

Buyers of big cars will fork out more tax while those who opt to buy smaller models will pay less from April 1.

Consumption taxes on passenger vehicles with engine capacity larger than 2 liters will be lifted to a maximum of 20 per cent from 8 per cent, the Ministry of Finance said on its website yesterday.

At the same time, levies on cars with engine capacity between 1 and 1.5 liters will be cut to 3 per cent from 5 per cent.

The changes are apparently to curb people from buying gasoline guzzlers, such as sport utility vehicles (SUVs) and large sedans, and conserve oil in the energy-hungry nation.

On Tuesday, the ministry announced that consumption tax would be levied on oil products in a move to regulate and reduce energy usage.

The country's current Five-Year Plan (2006-10) lays great stress on energy conservation and sustainable development.

Oil consumption by automobiles has been increasing rapidly as a result of fast-growing vehicle sales China is the world's No 3 vehicle market after the United States and Japan.

According to the State Council Development and Research Centre, a top think tank, automobiles are expected to devour 138 million tons of oil a year by 2010, accounting for 43 per cent of the nation's total consumption.

The proportion will jump to almost three-fifths by 2020, it said. In 2000, the figure was one-third.

The research centre predicted that China's annual vehicle demand would reach 9.4 million units by 2010 and 18.9 million units by 2020, up from 5.7 million units last year.

The new tax policy is expected to encourage people to buy economy cars.

Li Hangchen, a 30-year-old executive in Beijing, told China Daily: "With the new tax, I will buy a 1.5-litre car, rather than the 2.5-litre SUV which I was planning to. It will save me thousands of yuan."

Analysts said the tax change would affect automakers' product strategy.

"The change will mean the launch of more small cars in the coming years," said Jia Xinguang of China Automotive Industry Consulting and Development in a telephone interview.

Partly in anticipation of the tax move, Tianjin FAW Xiali Automobile, an affiliate of China's top vehicle maker First Automotive Works Corp, recently said that

it would launch nine new models within the next five years to be a leader in China's economy car market. The company aims to double its sales to 400,000 vehicles by 2010 from last year.

The new tax policy drove down shares of manufacturers of SUVs and large sedans.

For example, shares of Hong Kong-listed Great Wall Motor, China's biggest SUV producer, tumbled 3.8 per cent to HK$4.45 (US$0.57) yesterday, the biggest one-day percentage drop over the past six weeks.

THE HINDU

Indian firm taps China's appetite for green energy

By Pallavi Aiyar
March 16, 2006

While January's agreements on Sino-Indian cooperation in hydrocarbons have been grabbing the headlines of world-media, real collaboration has begun in another less high profile, but potentially significant area: that of renewable energy.

The Pune-based wind turbine manufacturer, Suzlon Energy, held a ground-breaking ceremony on Wednesday for its factory in the eastern Chinese port city of Tianjin. The $60 million investment that Suzlon is making in its China factory is the first by an Indian company in the Chinese energy sector and one of the largest by any Indian firms in China.

The demands of China's burgeoning economy have led to a gargantuan appetite for energy. The mainland recently overtook Japan to become the world's second-largest consumer of energy, after the United States. Coal, which, as in India, provides around 70 per cent of China's energy, needs to be phased out if the country is to meet its commitments to the Kyoto Climate Control Protocol.

Faced with a combination of soaring energy needs and endemic air pollution, China has made it a priority to aggressively develop renewable energy technologies. Since January a new law on renewable resources has come into effect aimed at ensuring that by 2020, 10-12 per cent of the country's total energy mix will come from renewable resources.

The goal is to have 130 GW of installed renewable capacity within the next 15 years. At present, China's renewable energy consumption accounts for only three per cent of the total.

The new law obliges grids to purchase the more expensive renewable energy at prices fixed by the government.

The extra costs will be borne by consumers as a result of slightly higher prices for power. In meeting its renewable energy goals the Chinese government is encouraging foreign investments and collaboration, a chance that India's Suzlon has pounced on.

Suzlon is not only India's leading manufacturer of wind turbines, it is the fifth largest such company in the world. "Given China's huge potential in wind and encouraged by the provisions of the new renewable energy law, we decided to enter this market," said Paulo Fernando Soares, Chief Representative Officer for Suzlon in China.

China's current installed wind energy capacity stands at some 1,260 MW, but according to government targets this must be scaled up to 5,000 MW by 2010 and 30,000 MW by 2020.

China's potential for on-shore wind energy is, in fact. a weighty 250 GW, compared to India's 45,000 MW. However, India already has an installed capacity of 4,500 MW.

The majority of renewable energy programmes in China, including wind, are now being set up in collaboration with European firms. For India, which started developing its wind energy market much earlier, this is a window of opportunity.

Foreign companies investing in renewables in the mainland are eligible for tax breaks and other benefits. However, there is a 70 per cent localization clause.

Hence, Suzlon's decision to set up a manufacturing facility in China.

The factory, scheduled to begin operations in August, will manufacture rotor blades, generators and control panels and will have an annual capacity of 600 MW for all components.

Suzlon has already two contracts in China for 50 MW of equipment each, both to be installed in 2006, in the Inner Mongolia Autonomous Region and Shandong province.

According to Mr. Soares, Suzlon's plans for the Tianjin facility include a learning and development centre that will "facilitate the transfer of the company's experience and knowledge — and help in developing skilled and educated manpower in China."

EU, China to sign pact on clean coal technology

February 19, 2006

The European Union (EU) and China will sign a Memorandum of Understanding (MOU) on near-zero emissions coal technology next week, the European Commission (EC) announced here on Sunday.

The pact will be signed by EU Energy Commissioner Andris Piebalgs and Ma Songde, China's Vice Minister for Science and Technology during Piebalgs' visit to China next week.

The MOU builds upon and strengthens work on such programs or areas as the Action Plans on clean coal technologies, energy efficiency and renewable energy, the EU-China Dialogue on Energy and Transport Strategies, the Scientific and Technological Cooperation Agreement and the EU-China Energy and Environment Programme, according to the EC.

The MOU will encourage the development of technology allowing the capture and underground storage of carbon dioxide emitted from coal-fired power stations, a matter of potential significance in the fight against climate change.

"Energy is one of the EU's foremost concerns and I am glad to have this opportunity to discuss the way ahead with my Chinese counterparts," said Commissioner Piebalgs, who will also attend the 6th EU-China Energy Conference in Shanghai.

"This new agreement on zero emission power generation is another example of the developing partnership between the EU and China in science and research," EU Science and Research Commissioner Janez Potocnik was quoted by the EC press release as saying.

Carbon dioxide emissions from coal-fired power generation are growing rapidly and present a serious challenge to the long-term stability of the climate. During the EU-China summit last year, both the EU and China pledged to work together to combat their common challenges of energy security, increasing pressure on global energy resources and climate change.

The EU and China are also strengthening their scientific cooperation. There are more than 100 joint research projects carried out by Chinese and European teams. And China is also a partner in the Galileo satellite system and the ITER fusion project.

Behind the Chilly Air: Impacts of China's New Wind Pricing Regulation

By Yingling Liu
March 30, 2006

It came as a great shock to nearly everyone in the wind industry. In January, China's National Development and Reform Commission (NDRC) issued a regulation reversing its earlier intention to price wind power through a "feed-in tariff," a pricing policy that analysts and industry insiders had hoped would provide a big boost to Chinese wind energy development. Instead, according to the January 4 regulation, wind power prices will be determined through a competitive bidding process. As a core element of China's first Renewable

Energy law, which took effect in January, the pricing regulation had been anticipated eagerly since the National People's Congress approved the renewables law in February 2005. Drafts of the regulation, circulated for public comment in September and November, had stated clearly that the grid price for wind power would reflect the "nominal tariff of local desulfurized coal-fired power plants," plus a subsidy of ¥0.23 ($0.028 US) per kilowatt-hour (kWh). The November draft also stipulated that the return on investment for renewable energy power projects should be higher than the average return on investment of traditional power projects. Yet the final version of the regulation shows no trace of this language.

In the two months since its adoption, the new pricing measure has sent shock waves through China's wind industry. Experts worry that pricing through public tendering generates greater uncertainty, reducing investors' ability to control risks and thus reducing their incentive to invest in this nascent industry. Xu Hongliang, General Manager of China Fulin Windpower Development Corporation, believes the regulation will "throttle the whole industry."

The industry has reason to worry. The Chinese government has used a public tendering process to issue wind concessions since 2003, and the results have been meager at best. Under this process, provincial governments are responsible for selecting and opening proposed wind power sites to public bidding, and the developer that offers the lowest feed-in tariff wins the contract for long-term power purchasing.

The first concession project, Jiangsu-Rudong #1, attracted six developers, including investors from Germany and Spain. While five bidders offered a prince ranging from 7.6 to 9 cents per kilowatt kWh, one private company, Jiangsu Unipower Wind Power Company Limited, submitted a price of 5 cents per kWh. Deeming this to be too low to cover costs, experts suggested that the offer be rescinded. To their dismay, NDRC accepted it.

This "suicidal" low-bid discouraged private developers—both local and foreign—from entering China's wind market. All seven remaining concession projects went to state-owned power companies, with the winning bid ranging from 4.6 to 6.5 cents per kWh. According to Shi Pengfei, Senior Engineer of the New Energy Project under the China Hydropower Engineering Consulting Group, the current average cost of wind power in China is between 6.3 and 8 cents per kWh; thus, all the projects authorized so far will suffer a net loss.

Wind turbines waiting to unload.

Both private companies and state-owned enterprises have been lured by the huge market potential of wind energy in China. Since 2003, the country has faced severe electricity shortages, and more than two-thirds of its provinces suffered blackouts in 2004. The price of coal, which generates more than 70 percent of China's electricity, has been rising steadily since then, making wind power a promising alternative.

Most developers have their sights on more than just the profitability of a single project. In offering its seemingly unreasonable bid price, UniPower, a real estate company, was seizing an opportunity to break into the energy field, the traditional turf of state-owned enterprises. Unfortunately, after winning the bid in 2003, the company experienced two years of difficulty in securing bank loans and equipment, and has only recently begun construction.

State-owned companies, on the other hand, are jostling for wind power concessions because they expect the country's new Renewable Portfolio Standard (RPS), which is still under deliberation, to require them to meet specific renewables targets as China aims to ensure a greater share of renewable energy in its electricity portfolio. At the same time, these companies must cajole NDRC decision makers for other large hydropower and coal power projects, from which they make the lion's share of their profits. Blessed by close ties with China's state banks, they have an advantage over private

enterprises in obtaining bank loans, regardless of the profitability of the project.

Experts also worry that the new pricing regulation is not practical: it lacks a detailed plan on how to implement the bidding process and leaves considerable room for maneuvering. "It seems to have set up a platform for fair competition, but there is indeed a big hole," said Shi. "There are no concrete rules to follow, and every bidder can be vindicated as the winner." Past experience has shown that China's unique governing structure, where the regulator is also the implementer, makes it nearly impossible for any real commercial bidding to take place.

Ren Dongming, Deputy Director of the Renewable Energy Development Center of NDRC's Energy Research Institute, believes this situation won't last long. "There should be rules of the game," he said, referring to the process for selecting "winners" in future tendering processes. A new round of tendering is likely to start in about a month, with the results to be announced in September.

Experts in China's wind industry are hoping the new regulation is just temporary, and that it won't take long for regulators to make adjustments. Xu hopes the regulation will be "the last severe chill before the spring fully ushers in," while Shi is "patiently waiting to see what happens."
An authority with Gangdong Mingyang, a private Chinese company that recently began collaborating with the German manufacturer L'Aerodyn on turbine development, believes the regulation will not hurt his business, noting that it will be at least two years before the designs are completed and the new turbines are manufactured for commercial use. Cooling down the heated market, he believes, provides the venture precious time to grow. But, he added, "If the low bid pricing lasts too long, investors will lose interest and confidence in the market. We are concerned with follow-up investment in our research and development endeavor."

But Yu Wuming, a senior manager with GoldWind, is concerned that by causing market volatility, the regulation may still harm domestic manufacturers. "Sound development of the entire industry, including the manufacturing sector, requires stable market demand," he explained. Introducing greater competition through a more favorable policy, he believes, will force the sector to improve itself. "It's not that the higher the price is, the less the industry develops," he said, "In fact, it's the other way around."

Though no fundamental revision in the wind power pricing regulation is foreseen, the measure is temporary and thus always subject to change. As Shi Pengfei puts it, "The wind industry in China is at a crossroads. One road leads to a planned economy under the banner of 'bidding', the other to sustainable development." It will take patience, and a learning curve, to find out which path the wind industry will follow.

THE NATIONAL ENGLISH LANGUAGE NEWSPAPER
CHINA DAILY

Wen sets environment protection goals

March 19, 2006

Premier Wen Jiabao has called on the nation to view environment protection from a strategic perspective while warning of a worsening ecological situation in some regions.

Targets set for economic growth were easily met in the country's 10th Five-Year Plan (2001-05) but major environment protection objectives set for the same period were not achieved, and new problems have emerged, said Wen at a two-day national conference on environmental protection that ended in Beijing yesterday.

It was the highest-level meeting on environment issues and is usually held only once during a premier's five-year term.

Of the 20 environmental goals set for the 10th Five-Year Plan, eight have not been achieved, the State Environmental Protection Agency said last week.

The unfulfilled goals include reducing discharges of sulphur dioxide, carbon dioxide and industrial solid waste, and improving wastewater treatment.

Wen blamed "lack of awareness, insufficient planning, illogical industrial structure and a weak legal

framework" for the severe environmental problems in some places.

According to the 11th Five-Year Plan (2006-10), energy consumption per unit of GDP will be cut by 20 per cent, major pollutants reduced by 10 per cent and forest coverage rise to 20 per cent from 18.2 per cent.

To fulfil the targets, the government focus should be put on both environment protection and economic growth, and the latter should not be at the cost of the former.

Wen set priorities for environmental protection strengthening water conservation, controlling atmospheric and soil pollution, enhancing ecological protection, improving the economic structure and boosting the environmental technology and protection industry.

He vowed that environment protection would be a factor in assessing officials' performance.

He asked local governments to release information on energy consumption and pollutant emissions every six months, control emissions and step up environmental assessment of construction projects.

Protective policies on exploitation of resources should be implemented, and legal and supervisory systems should be established, he said.

An editorial published in today's People's Daily hails the conference as a "milestone in China's environmental protection history."

The central business district in Beijing is covered by dust and smog April 18, 2006. [Reuters]

WORLDWATCH INSTITUTE CHINA WATCH

China Moving Away from Grain for Ethanol Production

By Yangling Liu
April 27, 2006

China will replace its use of grain as the main feedstock for ethanol production with more economical plant material, an official with the National Development and Reform Commission (NDRC), China's top policy planner, said at an April 19 seminar in Shanghai on bioresources. The switch is expected to alleviate rising concerns over food security, as Chinese use of grain for ethanol threatens to compete with domestic food production needs.

Shi Lishan, director of NDRC's Renewable Energy Division, told seminar participants that the commission has plans for new biofuel feedstock production bases in Shandong and Heilongjiang provinces, in Inner Mongolia and Xinjiang Autonomous Regions. Input materials being considered include sweet sorghum, cassava, sugar cane, and sweet potatoes, according to Shanghai Youth Daily.

Soaring oil prices and rising domestic demand for bio-based energy sources have galvanized expansion of China's ethanol industry. The country is now the world's third largest ethanol producer after Brazil and the United States, with an annual production capacity of one million tons.

China has initiated a nationwide campaign for ethanol fuel use as well. Currently, ethanol accounts for 20 percent of domestic fuel consumption. However, recent government increases in the prices for petroleum and diesel, by 300 RMB (US $38) and 200 RMB ($25) per ton, respectively, are expected to give the biofuel industry an additional push.

NDRC's goal is to reach two million tons of annual biofuel production by 2010, and ten million tons by 2020.

So far, China has relied on corn and wheat as its primary ethanol feedstock. After years of expansion, however,

distilleries have exhausted their grain stockpiles, and the use of new corn to meet biofuel production needs has begun to jeopardize food security in this populous country of 1.3 billion.

Drying corn in Yunnan, Southwest China. For the last six years, China has produced less corn than it uses (including exports) and above ground corn supplies are now at 30-year lows.

The policy shift is expected to invigorate the search for alternatives, either by expanding cultivation of more economical plants on marginal lands, or by scientific research into using "waste" residues such as cellulose to produce ethanol.

Driven by strong market forces, some distilleries have already responded to feedstock constraints. Tianguan Distillery in Henan Province is looking into sugar cane, sweet sorghum, kudzu, and cellulose to diversify its raw materials. And Fengyuan Group in Anhui Province made progress earlier this year in processing straw into ethanol. Research shows that the cost of production using straw could remain between 4,000–4,300 RMB ($500–537) per ton, an amount lower than for corn. The group is planning to construct a 300-ton pilot project using straw feedstock this year, according to Economic Information Daily.

新华网 NEWS CHINA VIEW www.chinaview.cn

Global warming swells Tibetan lakes

By Liu Dan
April 11, 2006

Gesang Cering habitually wakes up at midnight to check whether his house or sheepfold is flooded again, as he has often seen water oozing, or sometimes even spouting out from ground since year 2000, particularly in winter.

He has also noticed that lake Naigri Puencog, some eight kilometers from his home village in Nagqu Prefecture, northern Tibet, often swells.

"The pasture near the lake is flooded from time to time; in winter, it's often covered with ice," the man said.

Many local herders have witnessed similar situations: in many lake areas, water springs out of formerly dry places, roads are flooded, and alkali is found no more in what used to be alkaline lakes.
Even the oldest people in the village cannot explain the abnormal phenomenon. Some say it's inauspicious and invite lamas to perform Buddhism rituals, hoping to dispel the evil spirits.

"It's actually caused by global warming," said Bendo, a senior engineer with Remote Sensing Application Research Center of the Tibet Autonomous Region.

Bendo and his colleagues have been studying the floods in Nagqusince Aug. 2005. They conducted site surveys to five lakes in the prefecture and analyzed changes in the sizes of the lakes over the past two decades with remote sensing mapping.

"We found rises in rainfall as well as in air and ground temperatures in lake areas but declines in water evaporation, exposure to sunlight, and thickness of snow and frozen earth," he said. "We therefore decided global warming caused the lakes to swell."

Bendo said the average water level in Naigri Puencog and two other inland lakes rose by 12.6 meters in the

recent two decades, flooding an average 40.8 square kilometers of pasture, cropland and roads.

Despite the damages to the pastures and roads, many people say the local climate is milder than before as it gets warmer and rains more often.

"It's getting more comfortable here," said Zhang Jianhua who has been working in Nagqu for 11 years. "The once lifeless hills are covered in green. We used to wear jackets in summer but nowadays shorts and T-shirts are enough."

But experts say the impact of global warming is not always positive in Tibet. In Ngari Prefecture in western Tibet, for example, the warm but arid climate has had a negative effect on the local ecology, said Bendo.

Known as the "roof of the world", the Qinghai-Tibet Plateau is very sensitive to climate changes.

"Tibet's responses to global warming will provide valuable first-hand information to worldwide researchers on climate changes," said the expert.

Chinese scientists found in an earlier research that global warming had caused glaciers to melt fast at Mount Qomolangma, the world's highest area, threatening the balance of global water resources.

Global warming is melting glaciers in Tibet at a rate of 7.0 percent annually, triggering drought, desertification, and sandstorms in regions throughout China.

The New York Times

The Energy Challenge: Clouds From Chinese Coal Cast a Long Shadow

By Keith Bradsher and David Barboza
June 11, 2006

HANJING, China — One of China's lesser-known exports is a dangerous brew of soot, toxic chemicals and climate-changing gases from the smokestacks of coal-burning power plants.

In early April, a dense cloud of pollutants over Northern China sailed to nearby Seoul, sweeping along dust and desert sand before wafting across the Pacific. An American satellite spotted the cloud as it crossed the West Coast.

Researchers in California, Oregon and Washington noticed specks of sulfur compounds, carbon and other byproducts of coal combustion coating the silvery surfaces of their mountaintop detectors. These microscopic particles can work their way deep into the lungs, contributing to respiratory damage, heart disease and cancer.

Filters near Lake Tahoe in the mountains of eastern California "are the darkest that we've seen" outside smoggy urban areas, said Steven S. Cliff, an atmospheric scientist at the University of California at Davis.

Unless China finds a way to clean up its coal plants and the thousands of factories that burn coal, pollution will soar both at home and abroad. The increase in global-warming gases from China's coal use will probably exceed that for all industrialized countries combined over the next 25 years, surpassing by five times the

reduction in such emissions that the Kyoto Protocol seeks.

The sulfur dioxide produced in coal combustion poses an immediate threat to the health of China's citizens, contributing to about 400,000 premature deaths a year. It also causes acid rain that poisons lakes, rivers, forests and crops.

The sulfur pollution is so pervasive as to have an extraordinary side effect that is helping the rest of the world, but only temporarily: It actually slows global warming. The tiny, airborne particles deflect the sun's hot rays back into space.

But the cooling effect from sulfur is short-lived. By contrast, the carbon dioxide emanating from Chinese coal plants will last for decades, with a cumulative warming effect that will eventually overwhelm the cooling from sulfur and deliver another large kick to global warming, climate scientists say. A warmer climate could lead to rising sea levels, the spread of tropical diseases in previously temperate climes, crop failures in some regions and the extinction of many plant and animal species, especially those in polar or alpine areas.

Coal is indeed China's double-edged sword — the new economy's black gold and the fragile environment's dark cloud.

Already, China uses more coal than the United States, the European Union and Japan combined. And it has increased coal consumption 14 percent in each of the past two years in the broadest industrialization ever. Every week to 10 days, another coal-fired power plant opens somewhere in China that is big enough to serve all the households in Dallas or San Diego.

To make matters worse, India is right behind China in stepping up its construction of coal-fired power plants — and has a population expected to outstrip China's by 2030.

Aware of the country's growing reliance on coal and of the dangers from burning so much of it, China's leaders have vowed to improve the nation's energy efficiency. No one thinks that effort will be enough. To make a big improvement in emissions of global-warming gases and other pollutants, the country must install the most modern equipment — equipment that for the time being must come from other nations.

Industrialized countries could help by providing loans or grants, as the Japanese government and the World Bank have done, or by sharing technology. But Chinese utilities have in the past preferred to buy cheap but often-antiquated equipment from well connected domestic suppliers instead of importing costlier gear from the West.

The Chinese government has been reluctant to approve the extra spending. Asking customers to shoulder the bill would set back the government's efforts to protect consumers from inflation and to create jobs and social stability.

But each year China defers buying advanced technology, older equipment goes into scores of new coal-fired plants with a lifespan of up to 75 years.

"This is the great challenge they have to face," said David Moskovitz, an energy consultant who advises the Chinese government. "How can they continue their rapid growth without plunging the environment into the abyss?"

Living Better With Coal

Wu Yiebing and his wife, Cao Waiping, used to have very little effect on their environment. But they have tasted the rising standard of living from coal-generated electricity and they are hooked, even as they suffer the vivid effects of the damage their new lifestyle creates.

Years ago, the mountain village where they grew up had electricity for only several hours each evening, when water was let out of a nearby dam to turn a small turbine. They lived in a mud hut, farmed by hand from dawn to dusk on hillside terraces too small for tractors, and ate almost nothing but rice on an income of $25 a month.

Today, they live here in Hanjing, a small town in central China where Mr. Wu earns nearly $200 a month. He operates a large electric drill 600 feet underground in a coal mine, digging out the fuel that has powered his own family's advancement. He and his wife have a stereo, a

refrigerator, a television, an electric fan, a phone and light bulbs, paying just $2.50 a month for all the electricity they can burn from a nearby coal-fired power plant.

They occupy a snug house with brick walls and floors and a cement foundation — the bricks and cement are products of the smoking, energy-ravenous factories that dot the valley. Ms. Cao decorates the family's home with calendar pictures of Zhang Ziyi, the Chinese film star. She is occasionally dismissive about the farming village where she lived as a girl and now seldom visits except over Chinese New Year.

"We couldn't wear high heels then because the paths were so bad and we were always carrying heavy loads," said Ms. Cao, who was wearing makeup, a stylish yellow pullover, low-slung black pants and black pumps with slender three-inch heels on a recent Sunday morning.

One-fifth of the world's population already lives in affluent countries with lots of air-conditioning, refrigerators and other appliances. This group consumes a tremendous amount of oil, natural gas, nuclear power, coal and alternative energy sources.

Now China is trying to bring its fifth of the world's population, people like Mr. Wu and Ms. Cao, up to the same standard. One goal is to build urban communities for 300 million people over the next two decades.

Already, China has more than tripled the number of air-conditioners in the past five years, to 84 per 100 urban households. And it has brought modern appliances to hundreds of millions of households in small towns and villages like Hanjing.

The difference from most wealthy countries is that China depends overwhelmingly on coal. And using coal to produce electricity and run factories generates more global-warming gases and lung-damaging pollutants than relying on oil or gas.

Indeed, the Wu family dislikes the light gray smog of sulfur particles and other pollutants that darkens the sky and dulls the dark green fields of young wheat and the white blossoms of peach orchards in the distance. But they tolerate the pollution.

"Everything else is better here," Mr. Wu said. "Now we live better, we eat better."

China's Dark Clouds

Large areas of North-Central China have been devastated by the spectacular growth of the local coal industry. Severe pollution extends across Shaanxi Province, where the Wus live, and neighboring Shanxi Province, which produces even more coal.

Not long ago, in the historic city of Datong, about 160 miles west of Beijing, throngs of children in colorful outfits formed a ceremonial line at the entrance to the city's 1,500-year-old complex of Buddhist cave grottoes to celebrate Datong's new designation as one of China's "spiritually civilized cities."

Datong's grottos are disintegrating under a layer of coal dust.

The event was meant to bolster pride in a city desperately in need of good news. Two years ago, Datong, long the nation's coal capital, was branded one of the world's most-polluted cities. Since then, the air quality has only grown worse.

Datong is so bad that last winter the city's air quality monitors went on red alert. Desert dust and particulate matter in the city had been known to force the pollution index into warning territory, above 300, which means people should stay indoors.

On Dec. 28, the index hit 350.

"The pollution is worst during the winter," said Ji Youping, a former coal miner who now works with a local environmental protection agency. "Datong gets very black. Even during the daytime, people drive with their lights on."

Of China's 10 most polluted cities, four, including Datong, are in Shanxi Province. The coal-mining operations have damaged waterways and scarred the land. Because of intense underground mining, thousands of acres are prone to sinking, and hundreds of villages are blackened with coal waste.

There is a Dickensian feel to much of the region. Roads

are covered in coal tar; houses are coated with soot; miners, their faces smeared almost entirely black, haul carts full of coal rocks; the air is thick with the smell of burning coal.

China's coal mining industry is among the most dangerous in the world, resulting in the deaths of more than 5, 491 workers in 2005.

There are growing concerns about the impact of this coal boom on the environment. The Asian Development Bank says it is financing pollution control programs in Shanxi because the number of people suffering from lung cancer and other respiratory diseases in the province has soared over the past 20 years. Yet even after years of government-mandated cleanup efforts the region's factories belch black smoke.

The government has promised to close the foulest factories and to shutter thousands of illegal mines, where some of the worst safety and environmental hazards are concentrated. But no one is talking about shutting the region's coal-burning power plants, which account for more than half the pollution. In fact, Shanxi and Shaanxi are rapidly building new coal-fired plants to keep pace with soaring energy demand.

To meet that demand, which includes burning coal to supply power to Beijing, Shanxi Province alone is expected to produce almost as much coal as was mined last year in Germany, England and Russia combined.

Burning all that coal releases enormous quantities of sulfur.

"Sulfur dioxide is China's No. 1 pollution problem," said Barbara A. Finamore, a senior attorney at the Natural Resources Defense Council's China Clean Energy Program in Washington. "This is the most serious acid rain problem in the world."

China released about 22.5 million tons of sulfur in 2004, more than twice the amount released in the United States, and a Chinese regulator publicly estimated last autumn that emissions would reach 26 million tons for 2005, although no official figures have been released yet. Acid rain now falls on 30 percent of China.

Studies have found that the worst effects of acid rain and other pollution occur within several hundred miles of a power plant, where the extra acidity of rainfall can poison crops, trees and lakes alike.

But China is generating such enormous quantities of pollution that the effects are felt farther downwind than usual. Sulfur and ash that make breathing a hazard are being carried by the wind to South Korea, Japan and beyond.

Not enough of the Chinese emissions reach the United States to have an appreciable effect on acid rain yet. But, they are already having an effect in the mountains in West Coast states. These particles are dense enough that, at maximum levels during the spring, they account at higher altitudes for a fifth or more of the maximum levels of particles allowed by the latest federal air quality standards. Over the course of a year, Chinese pollution averages 10 to 15 percent of allowable levels of particles. The amounts are smaller for lower-lying cities, like Seattle, San Francisco and Los Angeles.

China is also the world's largest emitter of mercury, which has been linked to fetal and child development problems, said Dan Jaffe, an atmospheric scientist at the University of Washington.

Unless Chinese regulators become much more aggressive over the next few years, considerably more emissions could reach the United States. Chinese pollution is already starting to make it harder and more expensive for West Coast cities to meet stringent air quality standards, said Professor Cliff of the University of California, slowing four decades of progress toward cleaner air.

Nothing Beats It

China knows it has to do something about its dependence on coal.

The government has set one of the world's most ambitious targets for energy conservation: to cut the

average amount of energy needed to produce each good or service by 20 percent over the next five years. But with an economy growing 10 percent a year and with energy consumption climbing even faster, a conservation target amounting to 3.7 percent a year does not keep pace.

All new cars, minivans and sport utility vehicles sold in China starting July 1 will have to meet fuel-economy standards stricter than those in the United States. New construction codes encourage the use of double-glazed windows to reduce air-conditioning and heating costs and high-tech light bulbs that produce more light with fewer watts.

Meanwhile, other sources of energy have problems. Oil is at about $70 a barrel. Natural gas is in short supply in most of China, and prices for imports of liquefied natural gas have more than doubled in the last three years. Environmental objections are slowing the construction of hydroelectric dams on China's few untamed rivers. Long construction times for nuclear power plants make them a poor solution to addressing blackouts and other power shortages now.

For the past three years, China has also been trying harder to develop other alternatives. State-owned power companies have been building enormous wind turbines up and down the coast. Chinese companies are also trying to develop geothermal energy, tapping the heat of underground rocks, and are researching solar power and ways to turn coal into diesel fuel. But all of these measures fall well short. Coal remains the obvious choice to continue supplying almost two-thirds of China's energy needs.

China's Nanao wind farm in Guangdong is one of 43 wind farms in the country [Greenpeace]

Choices and Consequences

China must make some difficult choices. So far, the nation has been making decisions that it hopes will lessen the health-damaging impact on its own country while sustaining economic growth as cheaply as possible. But those decisions will also add to the emissions that contribute to global warming.

The first big choice involves tackling sulfur dioxide. The government is now requiring that the smokestacks of all new coal-fired plants be fitted with devices long used in Western power plants to remove up to 95 percent of the sulfur. All existing coal-fired plants in China are supposed to have the devices installed by 2010.

While acknowledging that they have missed deadlines, Chinese officials insist they have the capacity now to install sulfur filters on every power plant smokestack. "I don't think there will be a problem reaching this target before 2010," said Liu Deyou, chief engineer at the Beijing SPC Environment Protection Tech Engineering Company, the sulfur-filter manufacturing arm of one of the five big, state-owned utilities.

Japan may be 1,000 miles east of Shanxi Province, but the Japanese government is so concerned about acid rain from China that it has agreed to lend $125 million to Shanxi. The money will help pay for desulfurization equipment for large, coal-fired steel plants in the provincial capital, Taiyuan.

The question is how much the state-owned power companies will actually use the pollution control equipment once it is installed. The equipment is costly to maintain and uses enormous amounts of electricity that could instead be sold to consumers. Moreover, regulated electricity tariffs offer little reward for them to run the equipment.

In 2002, the Chinese government vowed to cut sulfur emissions by 10 percent by 2005. Instead, they rose 27 percent. If Chinese officials act swiftly, sulfur emissions could be halved in the next couple of decades, power officials and academic experts say. But if China continues to do little, sulfur emissions could double, creating even more devastating health and environmental problems.

Even so, halving sulfur emissions has its own consequences: it would make global warming noticeable

sooner.

China contributes one-sixth of the world's sulfur pollution. Together with the emissions from various other countries, those from China seem to offset more than one-third of the warming effect from manmade carbon dioxide already in the atmosphere, according to several climate models.

But the sulfur particles typically drift to the ground in a week and stop reflecting much sunlight. Recent research suggests that it takes up to 10 years before a new coal-fired power plant has poured enough long-lasting carbon dioxide into the air to offset the cooling effect of the plant's weekly sulfur emissions.

Climate experts say that, ideally, China would cut emissions of sulfur and carbon dioxide at the same time. But they understand China's imperative to clean up sulfur more quickly because it has a far more immediate effect on health.

"It's sort of unethical to expect people not to clean up their air quality for the sake of the climate," said Tami Bond, an atmospheric scientist at the University of Illinois at Urbana-Champaign.

The Hunt for Efficiency

The second big decision facing China lies in how efficiently the heat from burning coal is converted into electricity. The latest big power plants in Western countries are much more efficient. Their coal-heated steam at very high temperatures and pressures can generate 20 to 50 percent more kilowatts than older Chinese power plants, even as they eject the same carbon-dioxide emissions and potentially lower sulfur emissions.

China has limited the construction of small power plants, which are inefficient, and has required the use of somewhat higher steam temperatures and pressures. But Chinese officials say few new plants use the highest temperatures and pressures, which require costly imported equipment.

And Chinese power utilities are facing a squeeze. The government has kept electricity cheap, by international standards, to keep consumers happy. But this has made it hard for utilities to cover their costs, especially as world coal prices rise.

The government has tried to help by limiting what mines can charge utilities for coal. Mines have responded by shipping the lowest-quality, dirtiest, most-contaminated coal to power plants, say power and coal executives.The utilities have also been reluctant to spend on foreign equipment, steering contracts to affiliates instead.

"When you have a 1 percent or less profit," said Harley Seyedin, chief executive of the First Washington Group, owner of oil-fired power plants in Southeastern China's Guangdong Province, "you don't have the cash flow to invest or to expand in a reasonable way."

A New Technology

The third big choice involves whether to pulverize coal and then burn the powder, as is done now, or convert the coal into a gas and then burn the gas, in a process known as integrated gasification combined combustion, or I.G.C.C.

One advantage of this approach is that coal contaminants like mercury and sulfur can be easily filtered from the gas and disposed. Another advantage is that carbon dioxide can be separated from the emissions and pumped underground, although this technology remains unproven.

Leading climate scientists like this approach to dealing with China's rising coal consumption. "There's a whole range of things that can be done; we should try to deploy coal gasification," said Dr. Rajendra K. Pachauri, chairman of the United Nations-affiliated Intergovernmental Panel on Climate Change.

The World Bank in 2003 offered a $15 million grant from the Global Environment Facility to help China build its first state-of-the-art power plant to convert coal into a gas before burning it. The plan called for pumping combustion byproducts from the plant underground.

But the Chinese government put the plan on hold after bids to build the plant were higher than expected. Chinese officials have expressed an interest this spring in building five or six power plants with the new technology instead of just one. But they are in danger of losing the original grant if they do not take some action soon, said Zhao Jian-ping, the senior energy specialist in the Beijing office of the World Bank.

Another stumbling block has been that China wants foreign manufacturers to transfer technological secrets to Chinese rivals, instead of simply filling orders to import equipment, said Anil Terway, director of the East Asia energy division at the Asian Development Bank.

"The fact that they are keen to have the technologies along with the equipment is slowing things down," he said.

Andy Solem, vice president for China infrastructure at General Electric , a leading manufacturer of coal gasification equipment, said he believed that China would place orders in 2007 or 2008 for the construction of a series of these plants. But he said some technology transfer was unavoidable.

Western companies could help Chinese businesses take steps to reduce carbon-dioxide emissions, like subsidizing the purchase of more efficient boilers. Some companies already have such programs in other countries, to offset the environmental consequences of their own carbon-dioxide emissions at home, and are looking at similar projects in China. But the scale of emissions in China to offset is enormous.

For all the worries about pollution from China, international climate experts are loath to criticize the country without pointing out that the average American still consumes more energy and is responsible for the release of 10 times as much carbon dioxide as the average Chinese. While China now generates more electricity from coal than does the United States, America's consumption of gasoline dwarfs China's, and burning gasoline also releases carbon dioxide.

An Insatiable Demand?

Pudong: The home of China's rising middle class.

The Chinese are still far from achieving what has become the basic standard in the West. Urban elites who can afford condominiums are still a tiny fraction of China's population. But these urban elites are role models with a lifestyle sought by hundreds of millions of Chinese. Plush condos on sale in Shanghai are just a step toward an Americanized lifestyle that is becoming possible in the nation's showcase city.

Far from the Wu family in rural Shaanxi, the Lu Bei family grew up in cramped, one-room apartments in Shanghai. Now the couple own a large three-bedroom apartment in the city's futuristic Pudong financial district. They have two television sets, four air-conditioners, a microwave, a dishwasher, a washing machine and three computers. They also have high-speed Internet access.

"This is my bedroom," said Lu Bei, a 35-year-old insurance agency worker entering a spacious room with a king-size bed. "We moved here two years ago. We had a baby and wanted a decent place to live."

For millions of Chinese to live like the Lus with less damage to the environment, energy conservation is crucial. But curbing that usage would be impossible as long as China keeps energy prices low. Gasoline still costs $2 a gallon, for example, and electricity is similarly cheap for many users.

With Chinese leaders under constant pressure to create jobs for the millions of workers flooding from farms into cities each year, as well as the rapidly growing ranks of college graduates, there has been little enthusiasm for a change of strategy.

Indeed, China is using subsidies to make its energy even cheaper, a strategy that is not unfamiliar to Americans, said Kenneth Lieberthal, a China specialist at the University of Michigan. "They have done in many ways," he said, "what we have done."

Keith Bradsher reported from Hanjing and Guangzhou, China, for this article and David Barboza from Datong and Shanghai.