



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

Policy Recommendations

China Sustainable Energy Program

Ninth Senior Policy Advisory Council Meeting

November 2006

Hainan, China

大卫与露茜尔·派克德基金会
威廉与佛洛拉·休利特基金会 联盟
能源基金会

*The David and Lucile Packard Foundation, The William and Flora Hewlett Foundation,
in partnership with the Energy Foundation*

旧金山总部 San Francisco Office: 1012 Torney Avenue, #1 • San Francisco, CA 94129, U.S.A.

电话 Tel: (415) 561-6700 • 传真 Fax: (415) 561-6709 • 电子邮件 Email: china@ef.org • 网站 Web: www.efchina.org

北京办事处: 中国北京市建国门外大街 19 号国际大厦 2403 室 • 邮编: 100004

Beijing Office: CITIC Building, Room 2403, No. 19, Jianguomenwai Dajie • Beijing 100004, P.R. China

电话 Tel: (86-10) 8526-2422 • 传真 Fax: (86-10) 6525-3764 • 电子邮件 Email: china@ef.org • 网站 Web: www.efchina.org

Table of Contents

I. The Challenge of Saving Energy Demands Further Action (CSEP).....	1
II. Long-Term Implementation of Energy Intensity and Efficiency Standards: Moving Towards Cleaner Energy and Lower Carbon Emissions in 2050 (CSEP).....	18
III. Promoting Environmental Regulatory System Reform, Energy Savings, and Environmental Protection (CSEP).....	20
IV. Sustainable Urban Planning: Promoting Comprehensive Energy Saving in China's Cities (CSEP).....	28
V. Challenges to Implementing the Fuel Economy Standard (CSEP).....	30
VI. Setting Strict Vehicle-Use Fuel Quality Standards to Decrease Transportation Pollution in China's Cities (CSEP).....	32
VII. Promoting Voluntary Energy Efficiency Agreements and Furthering Energy Savings Work in Enterprises and Public Utility Units (Wang Xuejun).....	35
VIII. Achieving National Energy Efficiency Improvements Quickly (David B. Goldstein).....	38
IX. Implementation of the Renewable Energy Law: Practice and Concerns (Wang Zhongying).....	52

I.

The Challenge of Saving Energy Demands Further Action

China Sustainable Energy Program

The issue of energy saving in China is urgent. In the first half of 2006, energy consumption continued to grow faster than economic growth, reflecting the difficulty of meeting energy saving goals. We need to clearly understand and address these challenges, using new ways of thinking and acting to meet evolving conditions.

(1) Improve understanding, maintain confidence, and ensure the fulfillment of the Eleventh Five-Year energy saving goals

Energy conservation goals are the product of China's energy development strategy. The experience of high input, high consumption, heavy pollution and low efficiency energy development during the Tenth Five-Year Plan period (2001-2005) has led the government to place a restrictive index have provided us valuable warnings. In the Eleventh Five-Year development plan, energy consumption per unit GDP has been taken as a restrictive index in the government plan for the first time. In the area of energy efficiency improvement, China has, for the first time, gotten a quantitative index. Such a quantitative index marks a high degree of summation of over 20 years of practice which China has had in implementing a strategy of giving priority to energy conservation. This gives China a criterion to measure and implement institutional regulation, policy formulation and strategic planning.

Energy savings goals are central to ensuring sustainable energy supply in China, which has an immense population but is relatively lacking in energy resources: China's per capita remaining recoverable reserves of coal, oil and natural gas account for only 58.6%, 7.69% and 7.05% of the world averages, respectively. Currently, however, the economic growth in the country continues to follow a coarse, extension-based mode. With the damage that energy consumption has wrought to the environment and public health, it is critical for China to find a path for relatively fast economic growth that consumers relatively fewer resources.

Energy conservation goals are a powerful measure for promoting economic structural optimization and healthy economic growth in China. In the 26 years since reform and opening-up, China has undergone uniquely rapid and sustained economic growth. China's development goals for 2020 and 2050 indicate that this growth should be sustained for 40 or even 70 years. Thus far, we have formulated the specific economic development goals for 2020 and 2050; now, having quantitative indices for the three national policies of population, resources conservation and environmental protection, it is possible to optimize China's economic structure. Emphasis on quality and performance will be a powerful measure for ensuring that China undergoes healthy economic growth for the next 50 years.

Energy conservation goals are a means to address the challenges of environmental damage and climate change, which is humanity's greatest challenge and threat in this century. The current consensus view is that CO₂ content in the atmosphere must be below 400pm to control the Earth's temperature increase to within 2⁰C, a condition in which China plays a large and growing role: according to its current mineral energy consumption and CO₂

emission rate, China is very likely to become the biggest carbon emitter in the world before 2030. If China implements the 20% energy conservation goal in the several five-year plans before 2020, it will be possible to fulfill the goal of quadrupling the economy while doubling energy consumption by 2020. In addition, continued implementation of quantitative energy conservation goals in the longer time-frame of 2050 will allow China to reach several critical junctures: the capacity to maintain rapid economic growth with very little increase in mineral energy (carbon emission); the subsequent capacity to maintain rapid economic growth with no mineral energy increase; and finally, the capacity to decrease mineral energy while economic growth continues.

Energy saving goals are both political and economic, set by the central government not only for the Eleventh Five-Year plan, but also incorporated into planning and development objectives in ensuing decades. Though energy saving met with great difficulties in the first half of 2006, we must carry out the needed measures despite these setbacks. Currently, there is a need to overcome apathy in environmental attitudes, if China is to avoid more serious harm towards the environment and public health in the next few years. Economic and technological development has already become “path-dependent”, large amounts of resources have been wasted, and the goals of the “Eleventh Five-Year” Plan threaten to remain a hopeful vision. We need to make an overall strategic assessment to fully establish the urgency increasing energy savings, further prioritize energy savings, adopt powerful energy-saving measures, and strive to fulfill the energy conservation goals of this year and of “the Eleventh Five-Year” period.

(2) Strive to expand the 8 main energy-saving methods

The 8 major methods for fulfilling the energy conservation goals are *institutional regulation, market mechanisms, policy incentives, environmental restrictions, legislation guarantees, technological progress, structural change and consumption model*. These measures should be combined to optimize their total effect. While the central government has formulated and implemented various energy-saving measures, this paper sets out to put forward supplementary views and approaches. In keeping with the energy saving goals in the Eleventh Five-Year, these measures are broken down into near-term (2006-2007) and long-term (2008-2010) measures, as given in Table 1. In the near term, efforts should focus on strengthening institutional regulation, market mechanisms, policy incentives and environmental restrictions. Long-term strategy should focus on making technological strides, technological innovations in major fields, economic structural optimization and legislation for a sustainable consumption model. Efforts should be made to tap energy saving potentials and fulfilling energy savings goals in the industrial, construction, transportation and government sectors, as well as the energy-saving services industry.

Table 1: Eight Methods for Fulfilling Eleventh Five-Year Energy Conservation Goals

Time Effect	Basic Way	Near-Term Measures (2006-2007)	Long-Term Measures (2008-2010)
Near term	Institutional regulation	<ul style="list-style-type: none"> Specify the administrative department to address energy conservation goals Establish a system of energy conservation performance evaluation and accountability for government officials Break down the national energy conservation goals by region, department and sector, particularly by department and sector. Determine the market regulatory body of energy efficiency products, particularly of the construction sector In 2007, the central government will directly offer rotational training on all top officials of county-level governments 	<ul style="list-style-type: none"> Establish a powerful integrated administrative department for energy The energy department should formulate integrated energy conservation strategies Change the regulatory focus from supply to demand. Separate policy formulation from supervision Pay critical attention to energy saving in buildings and construction Further cooperation with the environmental protection department
Long term	Market mechanisms	<ul style="list-style-type: none"> Electricity pricing: Peak, trough and step prices Oil and gas pricing: Abolish subsidies and smooth out retail prices Policy-oriented financial institutions should adjust investment direction Abolish government subsidies, such as heating subsidies. 	<ul style="list-style-type: none"> Improve the resource tax and mining right bidding price mechanisms Smooth out coal, oil and electricity prices Reform the price system and internalize environmental costs to society Establish a sustainable strategic investment fund and investment-sharing system for banks Energy tax Establish an energy conservation fund Sound energy conservation tax system
	Policy incentives	<ul style="list-style-type: none"> Fully implement existing policy measures and strengthen implementation efforts Reduce or exempt taxes for highly energy-efficient products; lower taxes for energy-saving, environment-friendly products Fuel oil tax 	
	Environmental restrictions	<ul style="list-style-type: none"> Charge environmental fees to support energy conservation and renewable energy Use environmental assessment and standards to halt production or shut down heavy-polluting small enterprises and control the construction of new small-scale projects in high energy-consuming sectors 	<ul style="list-style-type: none"> Coordinate the 20% and 10% goals Promote the adjustment of power and energy consumption systems Adopt measures to address climatic change
	Legislation guarantees	<ul style="list-style-type: none"> Push forward the introduction of administrative regulations for energy conservation in buildings and the transportation sector in 2006 Push forward the introduction of the energy conservation law in 2007 Restart the revision of the power law and introduce it in 2007 <u>Establish provincial energy conservation supervision centers with law enforcement power</u> 	<ul style="list-style-type: none"> Supplementary regulations to the energy conservation law and the power law must be introduced before 2008 Introduce <i>The Energy Law</i> in 2009. Locally implemented regulations should be completed in 2010. <u>Establish litigation procedures, professional legal forces and economic court rulings</u>
	Technological progress	<ul style="list-style-type: none"> Formulate the technological development roadmap and 	<ul style="list-style-type: none"> Strengthen R&D and demonstrations and funds support

	<p>supplementary policies and investment measures for all industries to cooperate with the 10 major energy conservation projects of the National Development and Reform Commission</p> <ul style="list-style-type: none"> • Promote Energy conservation in the top-1,000 enterprises • Eliminate backward equipment, technologies and processes • Introduce primary standards for energy-consuming equipment and home appliances 	<ul style="list-style-type: none"> • Use the market to change technology and speed technological upgrades • Use foreign exchange reserves to buy new technologies and production facilities • Provide comprehensive standards for energy-consuming equipment and home appliances, upgrade the standards and make them more stringent within set terms
Structural change	<ul style="list-style-type: none"> • Adjust GDP growth rates and stress quality-based development • Shut down heavy-polluting and high energy-consuming small enterprises • Abolish export subsidies for high energy-consuming products 	<ul style="list-style-type: none"> • Encourage investment in tertiary industries and high and new technology industries • Continue efforts to establish large enterprises, reduce and shut down small enterprises and avoid the revival of high energy-consuming enterprises
Consumption model	<ul style="list-style-type: none"> • Support NGOs, publicize, supervise and promote the building of a resources-saving and environment friendly society • Promote 26⁰C air conditioning, 19⁰C heading and no-vehicle days • Government department must play an exemplary role in energy saving. 	<ul style="list-style-type: none"> • Change consumption behavior and models • Support and sponsor civil organizations • Enterprises' voluntary energy conservation agreement • <u>Encourage the purchase of green power and support the use of renewable energy</u>

Institutional regulation

Institutional regulation is a basis and safeguard for energy savings, and offers great savings potential, especially for the near-term. Inadequate regulatory ability and poor execution are the primary factors affecting the implementation of regulations and policies. Along with the reform of energy-related government departments, there is also a need to further improve the independent energy regulatory body, and to expand its role in energy policy and goals by granting it substantive regulatory responsibilities and power. Such areas include pricing, market access, investment examination and preparations, and energy market regulation.

In the regional breakdown of the 20% national energy conservation goal, there are contradictions between the energy conservation goals and the new performance assessment criteria and accountability system for government staff. Currently, localities report their goals, which are verified by the National Development and Reform Commission. Several major problems exist: first, instead of breakdown purely by region, the goal needs to be determined according to the level of economic development, economic structure, technological capabilities, resources availability, energy input and output in different regions, and the goals should be confirmed and implemented in the form of an agreement, after consultations with localities (according to the regional energy consumption data per unit GDP for 2005, regional variations were extensive). For instance, while Hebei and Shanxi are in the eastern and central regions, respectively, they would be better placed in the central and western regions for the purposes of setting energy savings goals. A more rational and effective breakdown of nationwide energy conservation goals would be to have 3 levels of the eastern region (excluding Hebei Province), the northeastern and central region (including Hebei Province but excluding Shanxi Province), and the western region (including Shanxi province). Such a method would also facilitate the disaggregating of energy conservation goals by prefecture and city. The disaggregating of energy savings goals is essential if information on evaluation criteria and accountability are to be assessed fairly. In 2007, adjustments to the existing disaggregating and implementation scheme should be adjusted; in addition, assessment criteria should be modified to give greater priority to energy saving and environmental protection.

Another shortcoming in the current disaggregating scheme is the lack of differentiation between departments and sectors, which can play significant roles in energy saving efforts. All sectors in China, particularly the three main energy-intensive sectors of industry, construction and transportation, have an industry association, which are sources of familiarity with the technological status, production processes and problems with energy saving and environmental protection in their respective industries, in addition to experience with technological innovations and renovation. For instance, in the power sector, the China Electricity Regulatory Commission's main regulatory content consists of electricity conservation and demand side management; grid companies should also assume a major role in electricity conservation. The involvement of industry associations can also avoid the resource waste from provinces and municipalities formulating overlapping technological guides for various sectors. Disaggregating by department will eliminate such "blind spots" by forming a network of sectors and regions. Breaking down the goals by department will also make it possible to fully mobilize the interests of industry associations, the energy regulatory body, grid companies, and the overseeing department. At the same time, department and industry associations should be granted certain powers, such as the power to make suggestions on market access; should formulate and put forward near-, mid- and long-term roadmaps for the development of technology and processes; and should introduce

international management experiences and technological advancements, communicating with international bodies to introduce best practices. Upon disaggregating the goals by department and region, enterprises will be presented with two energy conservation targets. They should adopt the more stringent target as their formal energy saving goal.

The implementation capacity of regions and departments is key to realizing the 20% energy saving goal. Since reform and opening-up, decentralization has furthered economic growth, but has also brought about inconsistencies in implementation. In the Eleventh Five-Year Plan, for example, localities have raised the GDP growth target suggested by the central government, and have been enthusiastic and aggressive in pursuing these objectives. With the three major restrictive targets, however, implementation has been weakened as localities lower targets, report difficulties and complain about resource shortages, in keeping with the saying “Measures from above; countermeasures from below.” Improving regulation of the energy savings market is the primary measure for ensuring energy savings in the near term, as this market is currently chaotic and marked by inconsistent quality and fraud, which have a negative impact on the prices of efficient products. Buildings and residential homes are the biggest energy-consuming products. However, the problem of undercompliance has existed for years, and even today, fewer than 35% of the new buildings actually meet energy consumption specifications and standards. Inadequate regulatory ability hampers the implementation of energy savings approaches and causes serious investment shortages. It would thus be beneficial to supplement the government’s market regulatory power by giving a degree of regulatory authorization to third parties, e.g. industry associations, consumer associations, and non-governmental organizations.

County-level governments are at the forefront of regulation and policy implementation. For years, lack of regulatory capacity at the county-level has resulted in frequent problems with land-use, environmental protection and energy conservation, destruction of the environment and waste of resources. Surveys show that county-level regulation is particularly lacking on eight fronts: manpower, knowledge, ability, funds, methods, authority, responsibility and laws and discipline. Local protectionism is a prevalent mindset, which has seriously hampered policy implementation. At the same time, high-level departments have not undertaken in-depth surveys and research at the front lines, and fail to offer adequate guidance and supporting measures for county-level social and economic development. To implement the restrictive indexes for energy conservation and environmental and land protection, there is a need to adopt both top-down approaches from departments, provinces and municipalities, as well as bottom-up paths starting with county-level governments. There is a need to integrate county-level social and economic development and to do substantial work at the grassroots level.

There is now a tendency for higher levels of government to assume that disaggregating energy savings goals and assigning these to low-level governments and enterprises is itself adequate as a measure against China’s energy problems. As a result, the situation today can be described as “thousands of measures are poured from the top, lower levels scurry around, but no results are produced.” To face this issue, high-level units should focus on three things: policy, funds and manpower. When agreements on the energy savings disaggregated goals are signed, there is also a need to concurrently sign agreements on or to specifically record the responsibilities of high-level governments. For example, fiscal and tax policies are produced by central ministries and commissions, which ought to more quickly introduce broad policies so that the high- and low- level governing bodies can join forces to control the energy saving initiatives well.

Market mechanisms

Market mechanisms follow two main paths. The first is further energy price reform and a greater role for price as an indicator and guide. Energy prices have long been low and can hardly control over-consumption of energy. Experience both at home and abroad shows that market mechanisms contribute to over 25% of energy savings. In the future, there is a need to properly adjust the prices of energy-related products, abolish government subsidies, eliminate the suspicion that high resource cost will lower competitiveness, and change the incentives of low-cost energy use to the restriction of high-cost energy use. In the long term, there is a need to push forward market-oriented coal pricing reforms and natural gas pricing reforms, and to research and formulate policies to raise the cost of over-quota energy consumption. In the near term, there is a need to strengthen and improve electricity price management and properly adjust product oil prices. Zhejiang is the first province in China to concurrently implement “step-wise electricity pricing” and peak-and-trough electricity pricing for residents. The concurrent implementation of these schemes has played an important role in promoting residents to save electricity and favor trough power. Currently, ordinary power plants require an investment of RMB6,000/KWh. By promoting peak and trough electricity meters for residents, Zhejiang has successfully transferred 1.50 million KWh of peak power; in other words, 1.50 million KWh fewer generating units had to be built, and the saved investment approached RMB9 billion. Peak and trough electricity pricing, stepwise electricity pricing and market-oriented product oil pricing reforms will be promoted nationwide in the near term.

Secondly, China must speed up investment financing system reforms and increase the percentage of investment in energy conservation and clean energy. Since the 1990s, there has been a rapid drop in the percentage of energy investment and energy conservation investment in the capital construction investment. The percentage of energy conservation investment in the total energy investment fell from 13% in the early 1980s to around 3% at the end of the Eleventh Five-Year. Calculated by the invariable price of 2000, investment in energy capital construction will need to reach RMB1.8 trillion between 2005 and 2020. New energy, energy conservation and energy environmental protection should account for some 40% of the energy investment. In other words, RMB7 trillion will be needed, with an average annual input of over RMB400 billion. To meet such demand, there is a need to rely on the State’s investment and financing policies and attract funds from all parties to support continuous energy construction. On the other hand, the State needs to increase its inputs, and promote new technology projects as the main channel for investment, rapidly increase the percentage of clean energy in the economic structure, and reduce energy consumption. Energy savings investment needs to make great strides in the following five-year plans to compensate for investment deficiencies in the past 10 years. The policy-based financial institutions of the State need to shift for-profit projects to energy conservation and infrastructure investment that produce social benefits. On the other hand, the central bank needs to formulate compulsory and incentive policies, and demand that commercial banks and financial institutions direct a certain percentage of investment and loans to energy saving projects, renewable energy and environmental protection. This requirement may be termed “sustainable strategic investment”, expanding the sources of investment to energy saving sectors. “Sustainable strategic investment” should focus on long-term gains of environment- and resources-friendly projects, rather than heavy-polluting and high energy-consuming projects with high profits in the short term. The government should resume the system of giving interest discounts on loans; however, there is a need to redirect, re-focus, and alter the

method of repayment by implementing a third party management model and reducing the management cost and losses of loans.

Policy incentives

Establish a fiscal and tax system for sustainable energy. Financial mechanisms are some of the most effective measures adopted by the government. Incentive policies include government budget expenditures, input of national debt, financial discount interest and subsidies, preferential taxation, government procurement and financial pledges. In certain situations, restrictive policies may be more effective. Such measures are primarily taxes, such as environmental tax, consumption tax, fuel oil tax, energy tax, resources tax and export subsidies.

In the near term, the policy incentive measures can be adopted as soon as possible. First, the State provides loans with discount interest to enterprises to help them carry out energy conservation and to update pollution control technologies. In all major industries, the government needs to accurately grasp the direction of investment, such as for large-scale dry-type vertical kilns in the cement industry. In the construction industry, the government needs to support new energy-saving construction materials, such as doors and windows, and expand the market share of energy-saving products. In the transportation sector, the government needs to prioritize energy saving in the automobile industry, pushing forward overall automobile efficiency and support for hybrid technologies. In cities, there is a need to significantly develop public transport systems, particularly large capacity, bus rapid transit systems. Secondly, there should be restrictive policies towards high cost use of energy, including such measures as restrictions on acquisition of paid mining rights, funds for ecological recovery, adjustment of fuel oil tax and resources tax, and urban heating supply system reforms. Thirdly, existing taxation policies need to be improved. Preferential measures for energy saving, such as accelerated depreciation of high-efficiency energy-consuming equipment, preferential income tax policies for energy-saving equipment, lowering the purchase tax of energy-saving and environment-friendly vehicle models, and the renewable energy tax, should be introduced at the optimal time. Finally, there is a need to increase fund inputs for energy conservation. Governments at all levels need to set up special energy conservation funds to support the promotion of high-efficiency energy conservation technologies and products, encourage enterprises to strengthen energy conservation, lower energy consumption and carry out technological renovation through direct financing in the market and utilizing loans from international organizations and foreign governments. Research on the energy conservation fund has been conducted for many years and many optional plans have been put forward. The energy conservation fund and special funds are one of the most effective policy tools and should be adopted and promoted in the near term.

What needs to be particularly stressed is that according to China's political and governing system, many policies and incentive measures need to be drawn up by the central government; particularly in financial and taxation policies, where local governments have little power. In guiding energy savings goals, the central government needs to come up with new incentive policies. Otherwise, the government will lose the ability to guide energy savings goals. For many years, the government has been striving to find a powerful economic lever to push forward energy savings. The energy tax is one such tool expressed as fuel oil tax in the transportation sector. Those who waste energy should pay taxes, while those saving energy should get tax reductions or exemptions. This can stimulate enterprises and consumers to save energy. Though the main goal of the energy tax is not to increase the government's

financial revenues, revenues from the energy tax can serve as a public benefit fund to support energy savings and renewable energy, and to fund subsidies for low income families. Introducing an energy tax during the “Eleventh Five-Year” period will have a major and decades-term impact.

Follow-up evaluation of energy savings policies is an urgent task. Before 2006, the government adopted and implemented many policies, laws and standards, which need to be evaluated to identify problems and improve implementation. For example, combined power and heat production is one of the most effective energy saving technologies in China. The grid access and pricing policies relating to combined power and heat production have long been introduced, but progress of combined power and heat production in recent years has been slow due to inadequate implementation of policies. Some policies need to be modified, supplemented and corrected based on changing conditions. Clearly, the necessary work is substantial; however, the government has limited man power and resources. Therefore, through sector energy consumption analysis, the government should focus on those fields that require 20% of inputs but generate over 60% of the outputs. For example, large-scale public buildings only account for 4% of total construction area but consume over 26% of the total energy consumed by buildings. By focusing on energy conservation in these large-scale public buildings, half of the conservation efforts may produce double of the results.

Environmental restrictions

Proper steps must be taken to strengthen external regulation of the energy environment. For energy-consuming products and high energy-consuming industries and enterprises, China needs to formulate and implement continually increasing energy efficiency standards and environmental protection standards, and to set up stricter market access thresholds. The energy and environment regulatory departments need to improve coordination and link the 20% energy saving and 10% pollutants reduction goals such that each furthers the other, as energy development and utilization and environmental protection are closely related. For example, the generation department may adopt the power generation efficiency standard and allocate emission quotas and pollutant rights trading according to power output, which can significantly improve efficiency. Generally speaking, the environmental standards are compulsory and are also more forcibly implemented than energy conservation. When small enterprises are shut down and outdated technologies are eliminated, environmental protection assessment and standards should be introduced and legal and law enforcement bases be provided to better fulfill the goals. (Energy savings promises good returns, but still requires inputs. If enterprises do not assume external costs, enterprises’ investment in energy savings will be much reduced.)

In practice, however, energy saving and environmental protection are separated due to division of power and lack of communication between the various departments. There is lack of communication between the current 10% pollution reduction goal and the 20% energy conservation goal. In the first half of 2006, the 20% energy conservation goal and the 10% environmental emission reduction goal were both in the red, which calls for government attention, but the National Development and Reform Commission and the State Environmental Protection Administration rarely mention energy savings and environmental protection as a major focus of the other party. For example, Gansu Province’s SO₂ emission index is zero, which leaves room for the development of thermal power and industries in the province. This structure, however, is bound to lead to increases in energy consumption. Also, irregularities remain for the environmental impact assessment and approval of energy

products. In the first half of 2006, 32 million KW of coal-fired power generating units were put into operation but only half have built-in and operational desulfurization devices. The situation was even worse in 2005: of the 55 million coal-fired generating units put into operation, only 40% were installed with desulfurization devices. Meanwhile, small thermal power generating units increased by over 310 million KW, and there existed no desulfurization devices for coal-fired power plants breaching the rules. We should change the current lag between energy saving and environmental protection,, strengthen the restrictive and guiding role of environmental measures, and develop clean and low-carbon energies.

Legislation guarantees

China needs to increase the constraint of laws and regulations, which provide the policy and legal basis for energy conservation in society. The Energy Conservation Law is the fundamental legal basis for guiding energy conservation. Due to various reasons, the Energy Conservation Law formulated in 1997 has been a weak constraint and has lacked regulatory force since its implementation, and major revisions are needed. The new energy conservation law should have strict specifications, comprehensive content, ease of operation, well-defined rewards and punishments, and clear responsibilities. It is hoped that the revised Energy Conservation Law will be approved by the National People's Congress in 2007 and will come into force in 2008.

Saving electricity is a key area of energy conservation in China. It is difficult to understand why the work to revise the *Electric Power Law*, which started in 2003 and was completed three years later, has been put aside at present. The final procedures for revising the *Electric Power Law* should be started as soon as possible. The State Council and the Financial and Economic Affairs Committee of the National People's Congress should attach importance to this work and lead the organization of follow-up activities. Given that the legislative environment of the energy sector has changed, revisions of *the Electric Power Law* should go hand in hand with the *Energy Conservation Law*, the *Energy Law* and the *Renewable Energy Law*. Hopefully, the *Electric Power Law* can keep pace with revisions, and that approval of the *Energy Conservation Law* will step up energy conservation efforts.

The *Energy Law*, the legislation of which has already started, is a major law for the energy sector. Running throughout the *Energy Law* are the central principles of sustainable energy development and the harmonious development of the economy, the environment and energy. At the core of energy development is energy savings is established as the core of energy development in China, and the law's legislative goal is that of establishing a resources-saving and environment-friendly society. The law includes goals for energy development and energy conservation in different periods. The *Energy Law* is expected to be introduced and implemented before 2009.

To strengthen energy savings in various sectors, there is a need to formulate the 3 major regulations as soon as possible; namely the *Administrative Regulations for Energy Conservation in Buildings*, the *Administrative of the Ministry of Communications for Energy Conservation* and the *Administrative Regulations for Energy Conservation in Industrial Sectors*. These regulations should be introduced by the end of 2007. The various departments and all provinces and municipalities need to formulate the relevant supplementary regulations and policies within six months of the formal promulgation of the state laws, and draw up detailed implementation rules for their region within one year so that the laws can be implemented on the date of their promulgation, thus safeguarding the authority of the laws.

In reality, there are many difficulties associated with law enforcement, and the new *Energy Conservation Law* will meet with enforcement problems similar to those that came across the Environmental Protection Law. Precautions needs to be taken: there is a need to set up economic courts and establish professional law firms to bring violators to justice. Subject to verification by provincial supreme courts, cases can be quoted as precedent. Without a set civil litigation system, the situation of non-authoritative and lax law enforcement will continue. Civil litigation may also occur in cases of heavy losses to peoples' lives and property.

Technological progress

Technological progress is a main driving force of energy savings and energy consumption reduction. In energy-intensive industries in China, energy consumption per unit of product is 15-30% higher than in advanced countries. If China reaches the level of an advanced country's energy efficiency, its energy conservation potentials can reach 300 million tons of standard coal when calculated by energy consumption by unit product and energy consumption by energy-using terminal equipment. As for technological progress and innovations, there is a need to focus on several measures with positive practical effects. Firstly, there is a need to formulate technology and process development roadmaps for various departments and sectors. These roadmaps may extend to 2020 and beyond, and should specify the technology and process options for the near, mid and long term, with the 2006-2010 period as the focus. For each period, the technologies and processes can be divided into he categories of mature, market development, demonstration and R&D. Meanwhile, technologies and processes to be eliminated should be listed. The technology and process development roadmaps should also specify supplementary policies, R&D funds, investment, human resources, and other needs. Industry associations need to play a leading role in formulating these roadmaps.

Secondly, an energy consumption standard and the labeling system for energy-using terminal equipment should be established. In accordance with the level of economic and technological development in China, national compulsory energy efficiency standards for major energy-using products, including energy-consuming equipment, home appliances, lighting apparatus and motor vehicles, should be formulated and implemented. For energy-consuming products with large energy conservation potential and that are widely used, there is a need to implement a unified compulsory energy efficiency labeling system, providing users and consumers with necessary information and guiding them to select energy efficient products. Through formulating the standards alone, the equivalent to 20-30 million tons of standard coal can be saved annually. Energy-saving products should be included in the government procurement catalogue. Efforts should be made to introduce and implement the energy efficiency standard for major industrial energy-consuming equipment and home appliances in 2007. All the standards for the energy-consuming equipment and products used should be established by 2010. Subsequently, the standard grade should be raised every 5 years to promote technological progress.

Thirdly, a list should be made of high energy-consuming and outdated products that are to be eliminated, as well as of energy-saving products, which are to be promoted. China has created catalogue of technologies for elimination and recommendation for many years, but the effect has not been satisfactory. The reason is not that the policy itself is not good, but

that country and city governments have allowed developments to drift, or failed to implement policy..

Finally, energy conservation technologies are numerous. Besides the independent development of key technologies, we also need market mechanisms to promote the introduction of technologies from abroad, as well as technological cooperation with foreign countries. There is a need to exchange market for technology and capital for manufacturing capacity, in order to narrow the gap with the internationally advanced level as soon as possible. China cannot do everything from scratch.

Structural change

Structural adjustment and change are two different concepts. Structural adjustment is the result of human effort and administrative means. Using market forces, it is possible to speed changes in economic structure. In the first half of 2006, the primary and tertiary industry grew by 5.1% and 9.4%, respectively. However, the secondary industry and particularly the added values of industries over a certain scale increased annually by 13.2% and 17.7%, respectively, far higher than GDP growth in the first half of the year. Energy-intensive heavy industries grew by 18.5%, faster than light industries with fairly low level of energy consumption, which increased by 15.8%. We need to strengthen and improve macro-level regulation and speed up efforts to establish a new energy-saving industrial system.

Several issues need to be discussed.

The first is the rational guidance of investment. Most of the high investment growth in the first half of the year took place in high energy-consuming industries. For example, investment grew by 457% in the coal mining and washing industry, 16.3% in the power and heat production and supply industry and 30.3% in the oil and natural gas extraction industry. The growing investments in these industries' investment drove up energy consumption. Large amounts of investment are needed in China's current economic development stage, and investment should not be "blockaded," but "diverted" to promote structural adjustment. The government should guide investments towards energy conservation, renewable energy and environmental protection, the tertiary industry, and hi-tech and new industries with high added values. There is a need to improve economic structure and quality and to make the industrial sector structure one of high efficiency and low pollution.

The second is industry structural change. The focus of industrial restructuring should be on developing the tertiary industry and lowering the percentage of secondary industries, particularly the percentage of high energy-consuming industries. Calculated by the current industrial structure, for every 1% rise in the percentage of the tertiary industry and every 1% drop in the percentage of other industries, nationwide energy consumption in China will fall by 28 million tons of standard coal and energy consumption per RMB10,000 will drop by 0.018 ton of standard coal. In industry, high energy-consuming sectors such as metallurgy, chemical industry and construction materials account for over 64% of the industrial energy consumption and only 25% of the output. Their energy consumption per RMB10,000 worth of added values is 5.69 tons of standard coal. If the percentage of these high energy-consuming sectors can be lowered by 1% and the percentage of the other sectors in industries is raised by 1%, annual energy consumption will be reduced by 22.75 million tons of standard coal, while energy consumption per RMB10,000 GDP will drop by 0.01 tons of standard coal.

The third is what is known as the optimum GDP growth rate. It is obvious that speed does not equal performance. If GDP growth can be lowered by 1%, coal consumption will be reduced by 30 million to 50 million tons of standard coal. In the first year of every five-year plan, new terms of offices begin, bringing about an impulse for high economic growth and investment growth. In the first half of this year, GDP grew by 10.9%. In 31 provinces, economic growth exceeded two digits. 23 provinces registered growth of over 12%. Governments in various localities seem to have very good methods for stimulating economic growth. However, they neither pay attention to how to improve the quality of economic growth, nor have the methods to do so within the period of regulation. Excessively fast growth gives rise to a multitude of conflicts and problems. Simple extension-type growth makes investors focus exclusively on near-term economic returns, with officials at all levels busy examining and approving endless projects, solving conflicting contracts and overcoming energy supply shortages, without time for long-term strategic planning or for formulating major decisions. This is a main reason why the environmental problem in China has remained unsolved for a long time.

Taking a longer-term view can render a clearer perspective. What growth rate do we need for the macro-level development goals of 2020 and 2050? Obviously, a volatile and very high growth rate is not sustainable, and both high and low economic growth rates are prone to result in waste of resources. A growth rate of around 9% is rational. Therefore, macro-economic regulation should lower the rate of economic growth and bring down the string demand. For example, between January and June 2006, GDP in Shandong Province grew by 15.7%, while 14 of its 17 prefectures and city all had GDP growth topping 17%. With so much attention to GDP growth, it is very difficult to optimize economic structure. Another example is that Shenzhen's GDP grew by 13.5% in the first half of 2006, which is half of the average 28% growth rate in the past 25 years. However, there was a notable improvement in social and ecological economic performance, as well as integrated urban development.

The fourth is whether industrial adjustment of surplus production capacities will become a mere formality. Between 1980 and 2000, Economic structural change was estimated to have contributed to some 70% of the energy saved. Though we can only forecast the economic structure in 2010 based on current policies, adjustment and market forces, the percentage of the contribution of economic structure is estimated to be at least 50%. A "light, clean, highly efficient" and energy-saving economic structure will undoubtedly strengthen the competitiveness and the sustainable growth capacity of the Chinese economy. But if we do as poorly in structural adjustment as during the transition from the Ninth Five-Year Plan period to the Tenth Five-Year Plan period, we may lose all the energy conservation potentials of structural adjustment, or even have negative progress. There is a need to shut down heavy-polluting and high energy-consuming small enterprises and replace their production capacity with efficient and clean large enterprises. Since the 1980s, several rounds of shutting down small enterprises have occurred. However, repeated orders have not been effective; once there is a period of high economic growth and strong demand, small enterprises rise again. The key to the macro regulation currently unleashed by the National Development and Reform Commission lies in overcoming the "drug resistance" of small enterprises which has developed as a result of local protectionism. Recently, we went to Shanxi, Guangdong, Guizhou and Gansu to conduct on-site surveys there, and found that activities were running counter to the direction of regulation. In many localities, small iron works, small melting factories and small mines were still developing quickly. Drawing upon the lessons of previous rounds of adjustment, there is a need to accurately forecast the next round of

demand under conditions of industrial production capacity surplus, in order to continue to expand the production capacities of big enterprises of “high efficiency and clean production” so that small enterprises have no room for survival in the next demand boom. From a long-term perspective, speeding up investment system reform and transforming government function are fundamental solutions.. However, we cannot ignore the regulatory role of government. We have lost several historic opportunities to use production capacity surpluses to adjust the industrial structure. We should not repeat past mistakes and lose these opportunities again.

Consumption model

Consumption models are normally “rigid” in nature, and are difficult to change once formed. The energy consumption model is closely related to the consumption value model, the planning model and the production model. Four social elements need to be understood when working with consumption models: the public, the government, enterprises and the media. There is a need to give attention to the role of supervision and participation by the public and strive to build a resources-saving and environmentally-friendly society, as energy consumption is driven by the public demand. It is clear that the consumption model of developed countries will not work for China. We should advocate a new public consumption model. When the standard of living improves, we should adopt clean energy and renewable energy to provide energy services.

In its supervision and participation, the public plays four main roles. One role is as the one who practices. The public should start energy savings with their individual actions. The second is the advocator of new ways of consumption. Citizens should be encouraged to take public transport, buy energy-saving and environment-friendly vehicles, purchase green electricity, and use 26°C air conditioning and 18° C heating. The third is the supervisor. In other words, the public should supervise the implementation of policies by polluters and the government. The fourth is the participant in policies, to push forward the advancement of new ways of consumption in society. Currently, energy saving is much weaker than environmental protection in terms of public awareness and non-government organizations. There is a need to support the development of non-government organizations and to combine environmental protection with clean energy and energy conservation, in order to push forward the establishment and development of new consumption models.

There is a need to encourage enterprises to sign voluntary energy saving agreements to work towards higher goals than those assigned by the government. Enterprises need to carry out sound self-supervision and to exercise self-discipline. In particular, energy-consuming products should be produced in compliance with compulsory energy efficiency standards. If sampled products fail to meet their reported standards, enterprises will be exposed in the media, and fined. Enterprises need to approach improving energy efficiency and reducing their pollution as effective measures for lowering cost, and to take developing low energy-consuming and efficient products as the foundation for corporate development. The government needs to formulate policies to encourage enterprises to take voluntary actions and to encourage consumers to change their behavior. For example, the government should offer rewards and grant low interest loans to those that sign voluntary agreements to meet higher energy savings goals, and provide after-sales discounts to consumers who buy high energy efficiency but high-priced products. In other words, the energy conservation fund should be used to offer subsidies.

Government departments need act as leaders and examples in energy savings efforts.. Energy savings renovation needs to be made to office buildings for central government organs and provincial and local governments, so that they reach the energy saving building standards. There is a need to widely publicize already-renovated government office buildings and projects so that can play an exemplary role. The government especially needs to be sound in urban planning, town and county layout, industrial productive force layout and transportation layout, and to include resource savings and environmental protection in their primary goals. Otherwise, once problematic plans are implemented, their defects will incur huge energy consumption costs over time.

The media's role consists of publicity and supervision, reporting the situation from the low levels to the high levels, and bringing orders from the high levels to the low levels. There is a need to expose non-compliant acts and decisions that do not save energy and do not protect the environment. There is also a need to commend outstanding enterprises and new trends. Consumer associations may publish and distribute magazines such as consumers' reports, gathering the information released by the government and the regulatory body, evaluating energy-consuming products, and guiding consumer purchases. In foreign countries, such magazines command a tremendous influence.

(3) Special measures for a special time

Though we understand the enormous difficulty of realizing the energy saving goals and the length of time needed to do so, the first year of progress in fulfilling the energy savings goals will nevertheless affect follow-up work. We have not yet used all possible countermeasures. In a special time, special measures and countermeasures must be adopted. The implementation standards may be used to screen those measures. We suggest the following special measures.

- The central government should resume the system of holding executive meetings on energy conservation, and expand it into a meeting on energy conservation, environment protection and land use to coordinate and lead the various departments to fulfill the 3 major restrictive goals. The National Development and Reform Commission should coordinate energy saving efforts, while the Ministry of Construction, the Ministry of Communications, the Ministry of Finance, the State Administration of Environmental Protection and other ministries and commissions should carry out energy saving together. Provinces and municipalities should set up an office on energy saving, environmental protection and land use to coordinate the work of the various departments. Some provinces and municipalities can keep their development and reform commission and economic commission, but need consultation to decide which commission is to play the leading role. The purpose of this decision is to avoid trifling disputes between departments.
- The relevant central ministries and commissions should introduce one or two important policies in the near term to move past the bottleneck of endless prolonged deliberation without resolution, a situation which has been in place for many years, and in doing so, take the first step to push forward efforts to fulfill the energy savings goals. Possibilities include the *Administrative Regulations for Energy Conservation in Buildings* and *Reform of Heating fee Systems for Buildings*, which the Ministry of Construction may introduce; the *Administrative Regulations for Energy Conservation in the Transportation Sector*, for the Ministry of Communications to formulate; or *the*

Preferential Tax Policies for High-Efficiency Energy-Saving Equipment and the Fuel Oil Tax, to be introduced by the Ministry of Finance. The corresponding departments and bureaus in provinces and municipalities should introduce 1-2 important implementation regulations in the near term.

- Adjust investment directions. Turn investment towards energy saving, renewable energy and environmental protection. Policy-oriented financial institutions should focus on optimizing economic structure, promoting advanced industry technologies and high-efficiency products, and expanding investments.
- Strengthen regulation capacity building and implementation. Localities should set up energy saving supervision centers that have real authority; implement the *Energy Conservation Law*, and fulfill energy savings goals. Establish non-profit third parties with government authorization to execute some of the government's market regulation powers and solve the problem of inadequate manpower and resources.
- Personnel should be dispatched from the central government to provinces and municipalities, from the provinces and municipalities to prefectures and cities, and from the prefectures and cities to counties, to carry out supervision and implement an accountability system. For example, officials who hold positions in the peoples' congresses and the political consultative conferences may return to their former fields to guide works. Through many years of survey and learning at different posts, officials' new perspective on development and on overall conditions will be of benefit to the energy savings and energy consumption reduction efforts.
- The Central Party School and the China National School of Administration should directly train top county officials and the rotation training should be completed by 2007.
- The energy conservation goals should be disaggregated by department, and notice should be given to the role of industry associations.
- Grid companies and local energy conservation associations should establish independent energy saving services companies.
- Energy saving renovations in office buildings of the central organs and provincial and regional government buildings should be completed by the end of 2007, so that the government can play a leading and demonstrative role.
- A quota management system should be promoted and implemented for major heavy energy-consuming and large-scale public buildings (hotels, office buildings and so on) that fail to fulfill their energy conservation quotas by the end of 2006. Over-quota energy should be bought at a high price.
- The 20% energy saving goal should only include mineral energy, while use of new renewable energy should not be included in the calculation of energy consumption. Given the uncertainties in energy demand, and given that the energy conservation indices are only for mineral energy (resources restriction, environmental pollution and climate change), the renewable energies developed since 2006 should be excluded from calculations towards the 20% energy savings goal. China should

encourage the development and utilization of local renewable energy, West-East Electricity Transmission, and cooperation between developed regions and western regions to develop and utilize renewable resources.

(4) The evaluation index system

When the energy savings goals are broken down by region and department and are closely linked with the performance assessment and accountability system for cadres, falsification of statistical data may occur. To prevent the occurrence of such practices, a complete evaluation index system should be developed. In addition to the energy data that is reported to the high-level department, the following evaluation content and indices should also be included:

- Amount of investment. Without investment, there will be no new energy conservation capacity. This is particularly true of energy conservation in the technological and structural fields. There is a need to list in detail amount of investment, investment projects and fields, and newly added energy conservation potential. Execution and reporting unit: Provincial Development and Reform Commission and Financial Department.
- Price signal and leverage. What price measures are adopted? What are the implementation effects? Execution and reporting unit: Goods Pricing Bureau
- Shut-downs, production halts, merging and transformation of heavy-polluting, high energy-consuming small enterprises, and elimination of technologies and products. In which industries are outdated small enterprises and outdated equipment, technologies and products eliminated? What is the quantity? What are the energy conservation potentials? What elimination method is adopted? What are the compensation mechanisms? Execution and reporting unit: Provincial Economic Commission/Provincial Development and Reform Commission
- What ways and means are being adopted to strengthen the market regulation of energy savings? What is the regulatory body for energy saving in buildings? How it is implemented? What is the effect? Execution and reporting unit: Provincial Construction Commission and provincial Quality Inspection and Technical Supervision Bureau.
- How many enterprises and units receive warnings and punishments? How many are publicly notified of their punishment? Execution and reporting unit: Provincial Energy Conservation Supervision Center
- Have energy savings data been sampled and verified? How many samples have been selected? What is the error from the actual data? Execution and reporting unit: Provincial Statistics Bureau
- Is cadre promotion/demotion done in accordance with the assessment criteria and the accountability system? Is public notice given of these assessments? Execution and reporting unit: Provincial Organizational Department and Supervision Bureau

II.

Long-Term Implementation of Energy Intensity and Efficiency Standards: Moving Towards Cleaner Energy and Lower Carbon Emissions in 2050

China Sustainable Energy Program

In 1980, during the early stages of the “Reform and Opening-up” period, Deng Xiaoping put forth a three-step plan for economic growth, with development goals for 2000, 2020 and 2050. From 1980-2000 China succeeded in quadrupling GDP while only doubling energy use. It was an extraordinary achievement in the history of the world’s economic and energy development.

China’s economy is continuing to develop rapidly, with the 2020 economic goals quadrupling relative to 2000 levels. In order to safeguard China’s energy supply, energy-efficiency, institutional improvement, environmental protection, government management, and market-driven sustainable energy development strategy, we need to continue to implement strategies that prioritize energy efficiency, repeating the more sustainable energy consumption trend of 1980-2000. However, developments during the Tenth Five-Year period have deviated from the 2020 strategic goals. Fast-paced economic growth has relied on high inputs of natural resources, high consumption, high pollution, and low efficiency. This kind of development path has caused natural resource waste, worsening environmental conditions, threats to public health, and dependence on foreign resources, bringing unprecedented challenges to the *2020 Energy-Efficiency and Sustainable Energy Development Strategy*.

In the past twenty years of China’s energy strategy, the 11th Five-Year Plan (2006-2010) is the first to include limits on energy consumption per unit GDP. Emphasizing energy efficiency, the Plan has led to the establishment of quantitative standards, which have provided a workable way to measure developments in management, policy and strategy. Efficiency standards address the core issue of ensuring China’s long-term, sustainable energy development. For a country that is currently modernizing rapidly, but has a relatively resource-impooverished population, the issue of reducing energy consumption while growing economically is clearly important.

In the 26 years since reform and opening-up, China has maintained a rate of economic development that the world has rarely seen. According to the 2020 and 2050 development goals, China is to continue this impressive growth for the next 40, or even 70, years. Deng Xiaoping already established the 2020 and 2050 economic development goals; now, quantitative standards have been added to the population, energy-saving and environmental protection agendas. The addition of such standards can improve China’s economic structure, and can ensure China’s economic health for the next 50 years.

Energy efficiency goals are a fundamental part of environmental and global warming mitigation strategies. Global warming is a global challenge; according to a World Bank report, one fifth of the health conditions in developing countries can be attributed to global warming and other pollution problems, costing millions of lives. Increasingly, scientific

data shows that global warming is an irrefutable phenomenon that humanity must come together to address.

According to 2004 global warming impact data, global warming's potential for destruction in China is enormous. China's droughts and floods will increase, and glaciers will retreat (glaciers in the western mountainous regions have already been reduced by 21 percent in the last two decades and will only continue to recede at an expedited rate), posing a grave threat to China's already limited water resources. By the end of this century, agricultural production costs will increase, with production decreasing and capacity falling by roughly 10 percent. Within the same timeframe, sea levels in the five coastal regions will rise by at least 30 to 60 centimeters. Freshwater supply and quality will diminish. In 2006, Beijing suffered frequent sandstorms, and Chongqing experienced an unprecedented 20 consecutive months of record high temperatures. Southern China has experienced extreme flooding, the north drought, and the frequency and damage inflicted by typhoons has increased significantly. These are insufferable consequences that demonstrate the danger global warming poses to China and the rest of the world.

Thus far, we have reached the following consensus on global warming: atmospheric carbon dioxide must stabilize at 450 ppm in order to keep global temperatures from rising beyond 2 degrees Celsius. According to China's current mineral resource consumption and carbon dioxide emissions levels, it is likely that before 2030, China will become the largest carbon-emitting country in the world. If, in the few Five-Year Plans before 2020, China can meet consecutive 20-percent energy intensity reduction targets, it will be possible to realize the goal of only doubling energy consumption while quadrupling GDP. Looking towards 2050, there are a number of consecutive challenges China must overcome in order to meet its efficiency targets: maintaining rapid economic growth with only slight increases in fossil resource use (i.e. carbon emissions); maintaining rapid economic growth while holding fossil resource use constant; and finally, maintaining rapid economic growth while reducing fossil resource use. The ultimate objective is to ensure that 2050 carbon emissions remain at the average 2030, or even 2020 levels. China's ability to implement these objectives will significantly influence growth in other developing countries, and the overall global efforts to mitigate global warming.

The challenge now lies in addressing the shorter-term issues of the 2020 goals, while keeping in mind the longer-term 2050 interests. In order to reach the 2050 goals, the current 2020 strategies need to take on a more far-sighted approach by considering these questions: Can China ensure stable economic growth in a sustainable manner? Will China's objective of building a harmonious society ensure long-term peace and stability? Can China's sustainable energy development meet the needs of rising living standards? Will we recognize the responsibilities that China must fulfill with regard to global warming? Every effort in the present must correspond with the 2050 plan.

There are many possible scenarios for the state of China's energy in 2050. The government is currently formulating the 2030 national energy strategy, and it is time to decide if China will take a sustainable energy development path. In order to meet Deng Xiaoping's 2050 goals, the 2020 and 2030 energy plans must mutually reinforce sustainability, utilizing energy efficiency and renewable energy standards to accomplish our energy goals.

III.

Promoting Environmental Regulatory System Reform, Energy Savings, and Environmental Protection

China Sustainable Energy Program

Energy consumption in China is having a serious effect on its environment. Excessive growth of energy consumption and a coal-dominated energy structure have increased the pressure on China's air pollution control efforts. Air quality in 60 percent of China's cities is over the Grade II Standard. 30 percent of China's land suffers from acid rain pollution, and trends are only worsening. Compared with the 1990s, the average concentration of sulfur and nitrate particles in rain rose by 15 percent and 33 percent, respectively. Areas of surface land subsidence in coal mining regions in China have reached 400,000 ha. Each year, coalmines discharge 2.2 billion tons of well water. Ecological destruction in China is only on the rise.

China is one of the few countries in the world that has made resource conservation and environmental protection fundamental national policies. Over the past 30 years, the State has put considerable manpower, material, and financial resources into environmental protection, and pollution prevention and control. However, the environment in China has continued to deteriorate and the environmental protection goals set in the country's various Five-Year Plans have never been met. The 11th Five-Year Plan (2006-2010) sets strict requirements for energy conservation and environmental protection, making lowering energy intensity by 20 percent and reducing major pollutants by 10 percent, the constraint control indices for national development. However, the unsatisfactory implementation of key projects in the 10th Five-Year National Environmental Protection Plan indicate major challenges in the coming years. During the 10th Five-Year Plan Period, desulphurization targets in China's thermal power industry were not only 70 percent fulfilled, while only 65 percent of key watershed pollution control projects were completed.

The primary reason for deficiencies in implementation is inadequate environmental regulation and law enforcement. The fundamental way to improve the environment is to start with the reform of the whole environmental regulatory system and improve law enforcement capacity. The main problems in the environmental regulatory system are the following: (1) Local governments are driven by economic returns, resulting in large numbers of illegal and high-polluting projects; (2) Administration of environmental protection is dysfunctional. There is a lack of direct administrative leadership between the higher and lower levels of environmental government, and environmental functions are dispersed among various departments, significantly decreasing efficiency; (3) The power of environmental protection departments is limited, greatly affecting their ability to participate in comprehensive decision-making; (4) Lenient regulations are the main cause of inadequate environmental law enforcement. The law enforcement measures for environmental protection are vague and punitive measures are not enforced; (5) Regulatory means are mostly administrative and lack supplementary policies and economic measures. A number of economic policies, such as ecological compensation and pollutant discharge fees are in urgent need of improvement; (6) Capacity building for environmental regulation is weak. There is a considerable gap between law enforcement capacity, the environmental monitoring system, the environmental regulatory information system, publicity and education capacity, and what is actually needed; (7) There is limited public participation; and (8) Both the national and provincial peoples' congress have not taken on their stated responsibilities

Recommendations for promoting environmental regulatory system reforms:

China has conducted research on environmental regulatory system reform for many years, realizing that there is the need to address the above challenges. Reform recommendations can be categorized into “Vertical and Horizontal” and “High and Low”. The “Vertical” is the reform of the vertical regulatory system for the environmental protection department; The “Horizontal” is the coordination between government departments in environmental protection work; The “High” is legal system building and the regularity responsibility of the people’s congress, while the “Low” is focused on the role of public participation in laying the foundation for environmental protection.

I. Improve and strengthen State environmental protection departments’ decision-making power and law enforcement ability.

For the vertical regulatory system, raise the political position of the environmental protection department and implement the “semi-vertical regulatory” or “vertical regulatory” system for environmental protection departments. For regulatory measures, focus on raising pollutant discharge fee rates, establish and improve ecological compensation mechanisms in mining areas, and promote the implementation of pollutant discharge trading and other economic policies. Regarding regulatory capacity, focus on improving law enforcement capacity building in Western China and at county and township levels, and greatly strengthen monitoring of provincial-level key pollution sources throughout China.

1. Set up a Ministry of Environmental Protection.

The State Environmental Protection Administration (SEPA) is currently the only environmental unit directly affiliated with the State Council. While it has ministry status, it lacks significant policy formulation powers and the ability to participate in high-level decision-making between ministries and commissions that are a constituent department of the State Council. The lack of systems unifying decision-making and supervision between resource development and environmental protection administrations has resulted in resource waste and environmental pollution. China needs a Ministry of Environmental Protection, as a constituent department of the State Council, in order to strengthen its participation in comprehensive decision-making, administrative capacity, and unify environmental supervision.

2. Grant legal status and administrative authority to regional supervision centers.

Regional segmentation and administrative disorder are problems that have long plagued environmental regulation in China. SEPA is currently working to establish five environmental protection supervision centers in East, South, Northwest, Southwest, and Northeast China, six nuclear and radiation safety monitoring stations in Shanghai, Guangdong, Sichuan, Northern, Northeast, and Northwest China, and 11 resident law enforcement supervision departments, which are directly administrated by the national environmental protection department. This will be an attempt to break local protectionism and implement vertical regulation. However, this type of regulatory system faces two main challenges regarding legal status and government functions.

Currently, the employees of regional supervision centers belong to public utility establishments rather than formal government departments, while employees of government departments are regarded as public servants. There is no guarantee that public utilities have the ability to supervise government departments. Regional supervision centers need to be gradually included in the government regulatory system to increase their legal powers, ability to coordinate environmental protection departments in their region, and power in stopping local protectionism. It is suggested that the National People's Congress and the State Council issue documents recognizing the legal power and government functions of regional supervision centers.

3. Improve the central environmental protection department' rights to personnel appointment and removal, and right to financial expenditure supervision over provincial environmental protection departments.

Central to the vertical regulation of China's environmental protection departments is the power of the central (national) environmental protection department to appoint and removal personnel, and to supervise the financial expenditures of provincial environmental protection departments. The existing central and provincial government environmental protection structure should remain the same, but there needs to be an increase in the authority and initiative of provincial environmental protection departments, in order to make them more responsible and accountable for provincial environmental protection work. The provincial environmental protection department should assume primary responsibility for major negligent accidents of environmental protection in its jurisdiction.

4. Implement vertical administration of environmental protection regulatory departments at the provincial level.

The provincial environmental departments need to directly administer county-level departments, including controlling personnel appointment and removal. The government must consider that varying regional economic and environmental challenges have lead to different capacities in environmental law enforcement. Therefore, the provincial environmental protection departments should have autonomy in formulating local environmental standards, personnel establishment, and environmental punishments, and in improving the operability of environmental law enforcement.

5. Consolidate county-level environmental protection departments and improve supervision capacity.

With China's rampant economic growth, many environmental disasters are directly related to the management of cities, townships, and counties. However, as the implementation of environmental standards in urban areas become more widespread, polluting enterprises have begun to shift to the countryside. This migration of industry has lead to the establishment of the urban-rural interface as the region with the most irreversible, and often fatal, pollution. County-level governments are the front line of supervision and policy execution. Over the years, accidents of environmental protection and resources utilization have occurred, in addition to environmental destruction and waste of resources. This is directly linked to the long-standing ignorance of county-level governments towards regulation. County-level supervision is lacking in eight aspects:

personnel, knowledge, ability, funds, means, authority, responsibility and law and discipline. Local protectionism is prevalent among country-level government officials. This has hampered policy implementation, resulting in weaker environmental law enforcement at the lower levels. The central and provincial governments should increase input, establish village, township and county environmental monitoring networks, and improve their environmental administration abilities.

II. Synergize and coordinate the regulatory power of horizontal environmental protection agencies.

Improve mechanisms for environmental protection departments to take part in comprehensive decision-making, specify the legal responsibilities and obligations of government departments and improve environmental protection effectiveness and efficiency.

1. Horizontal environmental protection departments need to have clear powers and responsibilities.

Currently, government function involving environmental protection is dispersed amongst various departments. There are institutional obstacles including department functions being misplaced, conflicting, or overlapping, thereby wasting research and administrative resources. It is not possible for the environmental protection department to monopolize all environmental protection functions, which need to rely on close cooperation between departments. Therefore, there is also a need to establish effective mechanisms to promote synergy and to coordinate the functions of the various departments. Through enhancing decision-making, supervisory and administrative functions, there is a need to ensure unified and comprehensive environmental protection work. As for international cooperation in environmental protection and climate change, the environmental protection departments should also shoulder major responsibilities: the environmental protection departments of various sectors need to in a consistent fashion, to coordinate environmental protection activities with administrative departments, and to assume accountability. If major environmental accidents occur in any given sector, the environmental protection department of that sector should also assume its corresponding responsibilities.

2. Coordinate action to fulfill the 20 percent energy intensity reduction goal and the 10 percent pollution reduction goal.

The two quantitative targets set in the National Eleventh Five-Year Plan are both restrictive and are mutually promoting. In the implementation process, coordination and consistency should be maintained to ensure efficient policy execution. For example, if environmental targets can be added to the National Development and Reform Commission's 1,000 Enterprise Energy Conservation Project, the total effect can be doubled if corresponding pollutant discharge agreements are signed. Furthermore, the addition of environmental targets can improve the reliability of data environmental discharge: absent a major change in technological conditions, pollutant discharge data can be measured by calculating energy consumption, relying on the fixed relationship between energy consumption and pollutant discharge. Doing so would allow for the verification of such data, and would greatly improve environmental administration capacity.

Strengthen the regulation of externalities in the energy realm. Increasing energy efficiency standards and environmental protection standards should be set up for energy-consuming products and energy-intensive industries and enterprises, along with more stringent market entry thresholds. The energy and environmental regulatory departments need to enhance coordination and make the 20% energy conservation goal and the 10% important pollutant discharge reduction goals mutually-promoting. For example, it is possible to adopt a power generation performance standard in the electricity generation sector. Allocating emission quotas and carrying out pollutant discharge trading according to the power output is an important way to raise the efficiency of use of pollutant discharge charges. Meanwhile, the power generation performance standard can serve as the basis for priority grid access and scheduling. In addition, environmental standards are generally compulsory and their enforcement is more intensive than energy savings regulations. When shutting down heavy-polluting and high energy-consuming small-sized enterprises and eliminating backward technologies, environmental protection evaluation and standards should be introduced, along with a legal basis for these laws and their enforcement. Although energy saving is cost-effective measure, it still requires inputs. If enterprises do not cover the external costs, their investment in energy savings will be greatly weakened.

III. Give priority to legislation and strengthen the system of environmental supervision, and enhance the accountability of people's congresses at all levels of government.

Regarding legally-binding measures, revise the Environmental Protection Law, significantly raise the environmental punishment standards, step up implementation plans and improve supplementary policies, such as total volume control. Delineate the authority of a system to enhance accountability of the supervisory departments of people's congresses at all levels, and promote and improve the system of civil litigation regarding environmental protection and resources utilization.

2. Revise the *Environmental Protection Law*.

There is a need to reexamine and evaluate existing laws and regulations. The *Environmental Protection Law* and several other important environmental laws have been in the midst of implementation for many years, to good effect; however, inherent defects still exist. As environmental protection activities progress, there is a need to make revisions and corrections, and to further the authority, severity and operability of the environmental protection laws. Therefore, we suggest that the Environmental and Resources Committee of the National People's Congress begin to modify and revise the *Environmental Protection Law* as soon as possible and to establish its position as the basic law for environmental protection, which will in turn facilitate the revision and legislation of various follow-up laws and regulations.

3. Environmental standards need to be forward-looking and operable.

Changes in the generation of pollutants and changes in emissions need to be incorporated in the process of formulating environmental standards, in order to improve environmental administrative ability and pollutant discharge reduction. For example, current environmental monitoring is mainly directed at air and water, and more attention is needed for the content of pollutants in soils, which affects public health through food consumption. In addition, the growth of such pollutants as PM₅, PM_{2.5}, NO_x, ozone,

CO₂, and various heavy metals have not been monitored as key pollutants. Thus, reduced *total* emissions of sulfur dioxide and COD may not necessarily represent a true improvement of environmental quality.

The impact of pollution on health has received widespread attention as an environmental issue. In addition, conducting in-depth scientific research on the impact of environmental pollution on health also forms the basis for formulating various policies and making legal judgments. Quantitative research on the topic also helps in analysis of the internalization of externalities in energy utilization, and lays the foundation for designing and introducing pollution prevention and control policies through economic means.

4. People's congresses at all levels should exercise their right of supervision regarding environmental pollution and resources utilization.

China has established congresses of people's delegates from the national level to the country level. The rights and supervision power which the Constitution has granted to people's congresses at all levels is the most characteristic aspect of China's political system. Unfortunately, many government officials at all levels still take economic growth as their primary concern, at the cost of the environment and public health. Under conditions in which the legal system and the mechanisms for public participation are still being established, the power of supervision exercised by people's congresses at all levels becomes particularly important. Currently, the power of supervision exercised by the National People's Congress and provincial people's congress is quite strong. However, supervision by city- and county-level people's congresses is very weak. People's congresses in some localities even waive their right of supervision. In addition, while exercising their power, people's congresses at all levels should implement an accountability system. Those officials of people's congresses who do ignore (or who cover up) acts of environmental law violations should be subject to administrative punishment.

5. Establishing and improving a system of public interest environmental law is a primary duty in efforts to improve the system of environmental law.

Public interest law is the central and the most powerful way in which the public engages in environmental protection and supervises environmental law enforcement in many countries. However, due to lack of laws, many environmental disputes cannot become legal proceedings, and administrative punishment is often inadequate. The interests of pollution victims cannot be guaranteed, and polluting enterprises thus feel a sense of security. In light of these problems, establishing a public interest system should be made the primary task in efforts to improve the environmental law system. Through a better system of public interest law, there will be greater participation from legal workers and the public to promote the improvement of laws, regulations and standards. In addition, courts and lawyers should strengthen their ability to tackle environmental cases.

IV. Establish public participation mechanisms and strengthen supervision for environmental law enforcement.

Improve public participation mechanisms, implement an information disclosure system, improve the environmental awareness of the public and push forward the development of non-governmental environmental protection organizations, thereby giving full participation

and mobilization for the public in matters of environmental protection and environmental supervision.

1. Fully realize the importance of public participation.

Establishing the concept of governance by environmental laws requires public recognition and participation; formulating and improving environmental legislation needs public participation; achieving environmental judicial fairness and ensuring the fairness and efficiency of environmental law enforcement requires public participation and supervision; and supervision and observance of environmental law is inseparable from public participation. The existing environmental legislation has not paid enough attention to public participation in environmental protection. Operability of the existing provisions is poor, the scope of the provisions is too narrow, the forms of participation prescribed are too monolithic, and the provisions for information support need to be improved. Legislation for public participation in environmental protection is in urgent need of improvement.

Public supervision and participation serve four main roles. One is that of the individual actor. Protecting the environment and saving resources should start with small, individual actions. The second is that of advocate for new consumption ideas and for a culture that prioritizes environmental protection and conservation. The third is that of supervisor, to supervise polluters and government policy implementers. The fourth is that of policy participant, to carry out new consumption trends in society.

2. Information disclosure is a precondition for public participation.

Open disclosure of environmental information is a precondition for the public to participate in environmental protection. Legislation for public participation in environmental protection should first make environmental information public, including information concerning the government and its relevant departments, environmental conditions, and various pieces of environmental information about enterprises. Legislation for public participation in environmental protection needs to specify what information must be made public, how it is to be publicized, how the public gets the information, who disseminates the information, how to cover the cost of government departments' information disclosure, and procedures for when false information is issued, or when legally-mandated disclosure does not occur.

3. Encourage the development of environmental NGOs and foster professional and orderly public participation.

The effectiveness of public participation in environmental decision-making and supervision depends in large part on its professionalism and orderliness. Through coordination by NGOs, it is possible to make the ordinary masses fully express their opinions in a more professional and more rational manner, and thus to greatly lower the social cost of public participation while raising its efficiency. NGOs can allow government and citizens to engage in dialogue in a systematic manner, and the NGO is one of the most important aspect of orderly participation for citizens.

Therefore, the government should provide a relaxed policy environment in which non-governmental environmental protection organizations can become established, and

develop. The environmental protection system can nurture a social atmosphere of orderly public participation, acting as the administrative department for environmental NGOs. Currently, several simple yet feasible measures for the government to support environmental NGOs include facilitating NGO-official interaction; allowing NGOs greater participation in administrative affair; and addressing the low standing of NGOs in society.

IV.

Sustainable Urban Planning: Promoting Comprehensive Energy Saving in China's Cities

China Sustainable Energy Program

Urbanization in China is skyrocketing. The percentage of China's urban population is expected to rise from 42 percent in 2005, to 60 percent in 2020. Urbanization is the main driving factor behind rising energy consumption. As the standard of living continues to improve, per capita energy consumption will also rise. For example, per capita energy consumption in Beijing reached 2.5 tons of standard coal in 2005. In the 11th Five-Year Plan, China has set the goal of lowering energy intensity by 20 percent by 2010. Currently, urban planning in China is based on a regimented, government-led consumption model, and once finalized, is very difficult to rectify. Cities, as the center of economic, transportation, and building development, have huge potential for energy conservation. Through sustainable urban planning, transportation planning, and architecture and design, significant progress in energy conservation can be achieved.

Currently, urban planning in China is not very advanced. Comprehensive planning systems have yet to be established for overall energy use, transportation, and environmental protection, resulting in disorderly urban design, where residents have to travel more and over longer distances. The development of public transportation is disastrously slow; city residents increasingly use private vehicles, leading to dangerous levels of air pollution, low efficiency, and high energy consumption. New green and energy-saving buildings fail to reach energy conservation and environmental protection requirements due to problems in design, construction, and inspection. Urban planning is mostly focused on economic growth, while the fundamental goal of building sustainable cities where the quality of life for residents is high, is ignored.

Experiences in international development show that through comprehensive land use planning that equally considers urban, transportation, and building development, it is possible to greatly reduce traffic congestion and pollution. Successful urban planning should focus on transit-oriented development (TOD) that ensures the highest density of businesses, residences, and other services be developed in an area that is convenient to public transportation, reducing the need for private vehicle use. Next, green belts should be set up to prevent urban sprawl and haphazard road building. Through these two important measures, it is possible to reduce energy consumption in urban transportation. In addition, energy conservation requirements for buildings should be specified in urban construction plans in accordance with the national standards for energy conservation in buildings.

The main measures to actively promote sustainable urban planning include the following:

- (1) The Ministry of Construction should develop urban planning guides that meet China's energy conservation needs. Additionally, corresponding employment opportunities and comprehensive public service facilities should be provided in plans for new and satellite cities.

(2) Establish mechanisms to ensure the legal force of urban planning, especially the effectiveness of laws promoting greenbelts and ecological areas, and forbidding disorderly development projects.

(3) Ensure TOD is the focus of urban planning and development.

(4) Prioritize the development of sustainable public transportation systems.

(5) Strictly implement standards for green and energy-saving buildings, speed up the use of renewable energy in buildings, and promote energy conservation measures.

(6) Integrate urban sewage, and solid waste disposal and reutilization, into overall urban plans.

V.

Challenges to Implementing the Fuel Economy Standard

China Sustainable Energy Program

To ease the energy and environmental pollution pressures brought about by automobiles, the National Development and Reform Commission (NDRC), the General Administration of Quality Supervision, Inspection and Quarantine, and the Standardization Administration of China have drawn up China's first compulsory national standard to control automobile fuel consumption—*Passenger Vehicle Fuel Consumption Limits*. This standard was officially released on October 28, 2004. It requires that passenger vehicles must meet certain requirements for the level of oil consumption per 100km. For new vehicles, the Stage I standard and the Stage II standard would be put into implementation on July 1, 2005 and January 1, 2008, respectively. For production-type vehicles, the implementation time will be postponed one year for both standards. In other words, the Stage I standard and the Stage II standard would be implemented as of July 1, 2006 and January 1, 2009, respectively.

It has been more than one year since the standard went into effect. Beginning July 1, 2006, all produced vehicles were required to meet the requirements of the Stage I standard. However, China has yet to form effective mechanisms to ensure the implementation of the fuel economy standards. Therefore, **the urgent task is to establish simple and effective standards implementation mechanisms to ensure that the standards can produce actual effects in raising vehicle fuel efficiency, and to safeguard the validity and authority of national standards implementation.**

In the 11th Five-Year Plan, China set the goal of lowering energy intensity by 20% and reducing the discharge of main pollutants 10% by 2010. As the fastest-growing sector in China, transportation should be made a key area of energy conservation work. However, increasing demand and lack of regulations, standards, and policies that promote energy conservation have continued to result in excessive increases in energy consumption in the transportation sector. In the first half of 2006, 3.63 million vehicles were produced and sold in China, up by 28.9% compared to the first half of 2005. During the same period, fuel consumption and imports rose by 15.6%. This astounding growth has made it very difficult for China to fulfill the goals set forth in the 11th Five-Year Plan.

At present, significant transportation energy conservation standards have not been implemented well. In 2005, the recommendation for implementing a fuel economy standard, made by the Policy Research Center of the State Council, received written instructions from Premier Wen Jiabao and Vice-premier Zeng Peiyan. Subsequently, NDRC joined forces with the Ministry of Finance (MOF) and the State Administration of Taxation (SAT) to conduct coordination work. Eventually, it was decided to adopt economic punitive measures to replace the practice of prohibiting production, as stipulated in the Standards Law, to implement the fuel economy standard. However, due to cross-departmental coordination problems, the measures of economic punishments have not been implemented. According to the provisions, large numbers of production-type vehicle models that exist at present should be brought under the scope of the requirements of the standard after July 1 of 2006. By the end of July, the State had taken no action to implement the standard for production-type vehicle models.

Given the current situation, the following recommendations are meant to promote implementation of the fuel economy standard and ensure energy conservation in the transportation sector.

- (1) With NDRC taking the lead, conduct thorough inspections of the fuel consumption levels of all production-type vehicle models as soon as possible. Use the fuel economy standard as the baseline to determine those vehicle models that fail to comply.
- (2) NDRC, along with MOF and SAT, should draw up economic punitive measures for vehicle models that fail to reach Stage I of the fuel economy standard, and implement them as soon as possible. If it is difficult to implement the measures due to time constraints, the compulsory punitive measures that prohibit production and sales should be adopted within the next two years. Meanwhile, active preparations should be made for when the implementation of economic punitive measures is appropriate.
- (3) Publicly release fuel economy standards for vehicle models and punitive measures for vehicles that fail to meet the standards. Guide enterprises to make standards-complying vehicles, and consumers to buy such vehicles.
- (4) Conduct further research to push forward the implementation of other economic incentives measures, such as reforming the vehicle purchase tax to directly link tax rates with vehicle consumption levels and stimulate the production, purchase, and use of more advanced energy-saving vehicles.

The passenger vehicle fuel economy standard is the most important policy for China to cope with energy shortages and rising fuel prices in the transportation sector. Its existence signifies that the central government is increasingly aware of the importance of energy efficiency, and the standard has received high-level attention and unanimous praises both in China and abroad. However, if it cannot be effectively implemented as soon as possible, its ultimate effect will be seriously weakened, undermining the confidence of the public and enterprises in the government's efforts to improve energy efficiency and build a resources-saving society.

VI.

Setting Strict Vehicle-Use Fuel Quality Standards to Decrease Transportation Pollution in China's Cities

China Sustainable Energy Program

Fast-growing energy consumption in the transportation sector is having an increasingly detrimental effect on China's urban environment. The *Report on the State of the Environment in China*, issued by the State Environmental Protection Administration (SEPA), shows that 40 percent of China's cities fail to meet the National Grade II Air Quality Standard. Consumable particulate matter and nitric oxide, two of the major pollutants that affect urban air quality, are closely related to emissions from motor vehicles, accounting for over 50 percent of the urban air pollution in China. SEPA, along with the Standardization Administration of China, successively implemented the National Stage I and II Standards for controlling pollution by motor vehicles in 2000 and 2004, respectively. The latest standard issued by SEPA demands that the European III and IV standards be implemented in 2007 and 2010, respectively.

However, there are significant deficiencies in China's implementation of the above standards, namely, the failure to formulate supplementary fuel quality standards. Developed countries, including the United States and Europe, have found that adopting the practice of concurrent implementation is the best way to ensure that the motor vehicle emission control standard is effective. The effective implementation of the motor vehicle emission standard hinges upon strict fuel control, particularly sulfur content requirements, to tackle the problem from its root cause. Currently, the level of average sulfur content in fuels in China roughly corresponds to the level of Europe I. Only a few cities provide fuels of Europe II quality. Because of the needs associated with the staging of the Olympic Games, Beijing implemented the 2005 Europe III emission and fuel quality standards at the end of 2005, which was ahead of the national schedule. Detailed information can be found in the following table.

European Standards: Fuel Quality Requirements (sulphur content, ppm)

	Europe I	Europe II	Europe III	Europe IV	Europe V
Gasoline	800	500	150	50	10
Diesel oil	2000	500	350	50	10

In light of current conditions, implementation of the oil product quality standard falls far behind that of the motor vehicle emission standard. In particular, no requirements have been set for oil products since the country formulated an implementation timetable for the National III and IV Motor Vehicle Emission Standards. China still has a gap to bridge with developed countries in terms of oil product production technology. The country cannot fully copy Europe's oil product quality standard. There has been a consensus among the scientific, environmental protection and petrochemical circles on the corresponding relationship between sulfur content in fuels and emissions. If sulfur content cannot be adjusted according to the requirements of the emission regulations, it will be very difficult to bring automobiles to meet the requirements of the corresponding standard. This will greatly compromise the

overall effects of motor vehicle emission reduction. Joint research conducted by the International Council for Clean Transportation, the US Environmental Protection Agency and Tsinghua University shows that if the automobile emission standard is made stricter in accordance with existing State regulations, and sulfur content in oil products is kept unchanged after reaching Europe II, particulate matter emissions can be reduced by 280,000 tons in 2020 through implementation of the motor vehicle emission standard. If sulfur content in oil products is adjusted simultaneously, particulate matter emissions from motor vehicles can be reduced by 380,000 tons by 2020. The cost of implementing the standards for sulphur content in oil products and emissions from motor vehicles in 2020 will be around RMB20 billion, while the environmental benefits will be close to RMB100 billion, giving a cost-effectiveness ratio of 1:5.

Improving oil product quality also makes China's petrochemical industry more competitive. After China joined the WTO, the domestic vehicle-use oil product market will be gradually opened to international oil companies. Currently, multinational oil companies such as BP and SHELL have made it clear that they have the ability to provide clean vehicle-use oil products, and can do so very soon. Big cities like Beijing have started to implement a strict emission standard. If Chinese petrochemical enterprises cannot produce clean fuels soon, China's vehicle-use oil market will be taken over by international oil companies. This is not good for the development of petrochemical enterprises or the Chinese economy, because improving oil product quality produces very good social benefits but increases enterprises' production cost. To spur enterprises to take initiative to carry out such technological renovations, the government should carry out macro regulation through strict quality standards and regulations, and encourage enterprises to increase investment, improve technology and produce clean fuel.

Based on current progress, we make the following policy recommendations:

(1) Draw up regulations to control sulphur content in oil products and set an implementation timetable.

Given the complexity of fuel product production technologies, it is very difficult for China to be on par with Europe's oil product standards. However, regarding sulfur content in oil products, there is a need to formulate corresponding regulations as soon as possible in order to cooperate with the implementation of the environmental protection standards. Currently, there is a need to require that 500ppm gasoline and diesel oil be provided nationwide. In 2008, China should supply fuels that meet the sulfur content set in Europe III and to gradually replace Europe II fuels. In 2010, the country should start to supply fuels that meet the sulfur content of Europe IV and gradually make all the fuel supplies meet the Europe IV Standard. Considering the need to reach European standards, the use of sulfur-free (<10ppm) gasoline and diesel oil should be included in the long-term plan.

(2) Establish government coordination mechanisms and ensure strict implementation of standards.

In China, implementing the fuel standard involves the National Development and Reform Commission, the State Environmental Protection Administration, the Standardization Administration of China and concerned industry departments. An effective administration system can only be established through coordination and administration by all the departments. Robust quality control must be achieved in the fuel production, transportation,

distribution and retail links to ensure the effective implementation of the fuel standard.

(3) Adopt economic incentives and tax regulation to improve fuel quality.

Economic incentives are the major mechanism by which government performs macro regulation under the market economy. Effective economic incentive policies can ensure returns on enterprises' investment and can promote fuel quality improvement. Some European countries such as Germany have adopted taxes as means to reach a very high fuel quality standard. Hong Kong has also adopted the same method to lower sulfur content in fuels to 50ppm from 1,500ppm within a very short period of time.

VII.

Promoting Voluntary Energy Efficiency Agreements and Furthering Energy Savings Work in Enterprises and Public Utility Units

*Wang Xuejun,
Peking University*

China Sustainable Energy Program

Statistics show that the industrial sector accounted for 67% of China's total energy consumption in 2004. In 2004, 1,000 key energy-consuming enterprises consumed the energy equivalent to 670 million tons of standard coal, accounting for 33% of the total energy consumption and 47% of the industrial energy consumption in China. To achieve the national goal of lowering energy consumption per unit GDP in 2010 by 20% from the end of the Tenth Five-Year Plan Period, the National Development and Reform Commission (NDRC) and the Office of the National Energy Leading Group organized an energy conservation program among 1,000 enterprises in April 2006, the Top-1,000 Enterprises Energy Efficiency Program (Top 1,000 Program). These 1,000 enterprises come from the nine key energy-consuming industries of steel, non-ferrous metals, coal, power, oil and petrochemicals, chemicals, construction materials, textile and paper-making. The objectives of this program are: significantly improve energy efficiency in the top 1,000 enterprises, bring the unit energy consumption by major products to the advanced level in their respective industry, require some enterprises to reach the international advanced or leading level in their industry, promote energy conservation, and fulfill the goal of saving the amount of energy equivalent to 100 million tons of standard coal.

The concerned government departments have broken down the energy conservation goals and all the enterprises have signed an energy conservation target responsibility agreement, promising to achieve certain energy conservation effects. The government will implement a series of measures, including assessment, evaluation and incentive policies.

We believe reaching the energy conservation responsibility agreement targets is beneficial to both the industrial enterprises and the greater society, and in order to promote the work of the Top 1,000 Program, voluntary energy efficiency agreement should be widely implemented. In the future, this model can be promoted to other high energy-consuming enterprises and public utility units, such as hotels and office buildings.

“Voluntary energy efficiency agreement” refers to an agreement that enterprises sign with the relevant government department to voluntarily promise to fulfill particular energy conservation goals within a certain period of time. Meanwhile, the government will provide these enterprises with incentive measures and/or public recognition. The voluntary energy efficiency agreements prescribe specific and measurable energy conservation goals, and include effective accountability mechanisms. The administrative department will also take on responsibilities specific to the agreement, including: (1) supervising enterprises' performance and (2) providing incentive measures. Incentive measures include public recognition of enterprises' good performances, releasing the names of these enterprises and their energy conservation achievements, and guiding the public and government departments to give priority to purchasing their products. The agreements are mutually beneficial; by adhering to

the agreements, enterprises can save energy, reduce pollution, and improve technology and management, while the government can fulfill its energy conservation goals and promote sustainable development of the local society.

Compared with other compulsory energy conservation means, the advantages of voluntary energy efficiency agreement in fulfilling energy conservation goals are, they:

- (1) Provide enterprises with greater incentives and flexibility to achieve energy and environmental goals, and promote the industrial environmental management model of active clean generation.
- (2) Encourage dialogue and trust between the government and enterprises, and between enterprises and the public, promoting more cooperative relationships;
- (3) Adapt to the needs of building a socialist market economy, and lower administrative and law enforcement costs.

Voluntary energy efficiency agreements originated in Europe, and in recent years have developed to become one of the primary international energy conservation policies. Governments that have established energy efficiency agreement with enterprises include the Netherlands, Britain, Canada, the United States, Australia, Denmark, France, Germany, Japan, and Norway.

Experience shows that energy efficiency agreements have played a very important role in energy conservation and environmental protection in these countries. In Britain, a climate change agreement (one type of energy efficiency agreement) and climate change tax are used together. If an enterprise signs a climate change agreement, it receives tax reductions. This gives great incentive for an enterprise to join the agreement. Through these policy measures, enterprises have fulfilled their energy conservation goals in a flexible and low cost way.

The Netherlands is among the countries that first implemented energy efficiency agreements, and they have achieved the widest implementation and the best results: 29 industrial sectors have signed agreements with the government, accounting for 90% of the country's total industrial energy consumption. Thanks to the implementation of energy efficiency agreements, energy efficiency has improved by 2% each year, up by 22% , from 1989 to 2000.

In China, under the leadership of the NDRC, the Shandong Economic and Trade Committee began in November 2002 to specifically organize pilot projects on energy conservation voluntary agreements in Shandong Province. In April 2003, the Committee signed voluntary energy conservation voluntary agreements, namely energy efficiency agreements with Jinan Steel and Laizhou Steel. In the past three years, the two pilot enterprises have continuously improved their management systems and measures and striven to lower energy consumption and raise energy efficiency, with notable achievement. In the three years since signing the agreement, Jinan Steel has lowered its overall energy consumption per ton of steel by 9.5%, and Laizhou Steel by 9%, with carbon dioxide emissions reduced by 1.23 million tons. Additionally, they have built up a good image of social responsibility.

Lessons learned from the two Shandong pilot projects include the following:

- (I) Strengthen organization and leadership.

In accordance with the requirements of the *Energy Conservation Voluntary Agreement of Shandong Province* formulated by the Shandong Economic and Trade Committee, the companies have set up a leading group on voluntary agreements with their board chairman as leader, and a working group on energy conservation voluntary agreement with their technology center as the lead. All the departments have made concerted efforts, simplified procedures, and focused on the goals specified in their energy conservation agreement.

(II) Establish and improve the energy conservation voluntary agreement pilot management system.

Combine the voluntary agreement management system with the existing energy management system to maximize their benefits and run the new management model of voluntary agreement throughout the entire management process. According to the requirements of the voluntary agreement, revise the energy management system, the system of executive meetings of the leading group, the energy assessment and statistical reports systems, include the energy conservation voluntary agreement in daily work, and ensure the fulfillment of the goals of the energy conservation voluntary agreement.

(III) Optimize iron and steel technologies and maximize equipment potential.

Continuously optimize workflows, increase equipment production capacities, and improve operational rates. Meanwhile, eliminate outdated technologies and lower manufacturing costs.

(IV) Focus on key links and efficient use of resources and energy.

(1) Reach the international advanced level of water consumption per ton of steel. Adopt a price-centered management system with stringent quotas, assessments, supervision, and inspections. Use water-free or low-water techniques in water-saving technological innovations, implement blast furnaces use converter dry-dust removal methods, and undertake new dry-quenching projects. According to the technical features, build dispersed waste water treatment facilities. According to the water use techniques, supply water based on quality requirements, save clean water, and meet equipment water demands;

(2) Fully recycle residual heat and energy. Promote the use of blast furnaces, converter coal gas recycling and utilization technologies, blast furnace TRT, dry cooling power generation technologies, and raise the level of residual heat and energy;

(3) Turn industrial waste residues into resources and achieve the closed utilization of iron-containing resources such as blast furnace dust, cementation dust, and converter mud;

(4) Adopt higher technical indices and achieve steel making with negative energy consumption. With reference to domestic and international advanced indices, research improving technical and economic indicators in the four major systems of iron making, steel making, steel rolling, and electricity. For new projects, actively promote and use advanced and applicable technologies, improve operational efficiency, and lower resources and energy consumption through advanced technologies.

(V) Based on the pilot work, the Shandong provincial government has set up an energy conservation fund to support the promotion of energy efficiency agreement projects in the whole province, and several enterprises in Shandong have actively applied to carry out energy efficiency agreement work. The provincial government plans to promote energy efficiency agreements among 100 highest energy-consuming enterprises. Through it, carbon dioxide emissions can be reduced by 3.67 million tons and energy consumption intensity

lowered 22% by 2010.

Experiences both at home and abroad show that voluntary energy efficiency agreements can play an important role in China's achievement of its national energy conservation goals for the 11th Five-Year Plan Period. We suggest that efforts should be made to promote voluntary energy efficiency agreement and further encourage enterprises and public utilities to carry out energy conservation work. The Top-1000 Program requires that the 1,000 highest energy-consuming enterprises fulfill their set energy consumption reduction goal. When the responsibility agreement was signed with the 1,000 enterprises, their energy conservation potentials were taken into account and certain consultations were made between the two sides. However, two problems still exist. First, the Top-1000 Program is a government-led activity, with stress placed on its compulsory nature, but with little consideration paid to different energy conservation potentials among the enterprises. The result is that enterprises do not take sufficient individual initiatives. Second, a considerable number of enterprises adopted a conservative stance in signing the target responsibility agreement, even though their potential for energy conservation is considerably larger. Therefore, more should be done to give promote enterprises' individual initiatives so that they can achieve higher energy conservation goals through voluntary energy efficiency agreements.

Enterprises and public utility units other than the top 1,000 enterprises should also be pushed to carry out energy conservation activities through voluntary energy efficiency agreements, and make their contributions to China's efforts to fulfill the 20% energy conservation goal. The specific suggestions are as follows:

- (1) Based on existing energy conservation goals for the various industrial sectors and enterprises, set higher voluntary energy conservation targets through voluntary energy efficiency agreements. Start with regional and industry pilot work, and then gradually promote it;
- (2) Large-scale public buildings, such as hotels and business buildings, account for 4-5% of the total number of buildings in China, but consume over 25% of the total energy consumed in the buildings sector. In addition to the industrial sector, voluntary energy efficiency agreements should also be promoted among large-scale public buildings;
- (3) The concerned government department needs to formulate relevant incentive policies, including loans with low interest rates, free energy audits and planning for enterprises, the return of pollutant discharge fees, and public recognition;
- (4) To standardize voluntary energy efficiency agreement-related work, the concerned department should draw up the *Implementation Measures for Voluntary Energy Efficiency Agreements*;
- (5) Establish scientific index systems to assess enterprises' energy conservation work, and related management systems to ensure the accuracy, authority, and effectiveness of assessments;
- (6) Apply energy auditing, energy planning, and technical and information support to support, supervise, and guide enterprises' energy consumption and energy conservation work.

VIII.

Achieving National Energy Efficiency Improvements Quickly

*David B. Goldstein, Ph.D.
Natural Resources Defense Council*

I. Introduction and Summary

The Chinese government recognizes the urgency of making prompt improvements in energy efficiency. In addition to its long-term target of a quadrupling of GDP with only a doubling of energy use, the 11th Five Year Plan calls for improving energy efficiency, measured in energy use per GDP, by 20% during the 2005-2010 time period.

Saving energy in the short-term involves different policy mechanisms than saving energy in the long-term. Many of the most effective long-term strategies have lead times that preclude the realization of substantial savings for the first several years, such as adopting upgraded building energy codes or constructing new Metro systems. These will be of little help in meeting the 2010 goal. Although this fact does not diminish their importance to overall environmental and economic policy, it does mean that additional effort is needed to meet the 2010 goal.

Relatively little attention has been paid to measures that could reduce energy intensity specifically in the short term, as distinct from policies of general interest and value that happen to deliver short-term savings as well as achieving long-term objectives.

This paper begins an exploration of some of these options. It discusses policies that could be implemented immediately in several sectors of the economy that account for the bulk of energy consumption.

All of these policies turn out to be consistent with, and indeed supportive of, a comprehensive long-term policy package giving first priority to cost-effective energy efficiency.

China can meet its ambitious 20% goal only if it focuses immediate attention on the policies that are described in this paper, and probably on others as well. But immediate action is necessary. Even the most effective programs have lead times of several months to a year or two from when they are adopted, and the process of government action to adopt them takes some time, as well.

A goal of improving energy efficiency 20% in 5 years is in general not that difficult – it amounts to a 3.7% compounded improvement per year. This is lower than the rate that has already been achieved by some products – for example, refrigerators in the United States--and is only slightly higher than improvements achieved in large economies, such as California or Denmark, which began at a higher level of efficiency than China.

But the scale is much higher in China, and the starting point in terms of infrastructure and capacity is much lower.

So the need to take quick action is higher, as is the need to focus greater attention on actions that can have short term effects on energy use. The international successes did not get started overnight, so the urgency of China's *taking prompt action* with a *focus on measures that can work in the short term* cannot be overstated.

A focus on short-term projects cannot come at the expense longer-term projects. The 20% savings goal for 2010 in the 11th Five Year Plan does not substitute for the longer-term goal of a halving of energy intensity; it is clearly intended as an effort to *place greater emphasis on energy efficiency* overall, not to re-prioritize the different approaches to energy efficiency policy.

The key measures discussed in this report are:

- Provision of performance-based financial incentives at the national level for advanced levels of energy efficiency in buildings and equipment¹.
- Reform of the regulatory structure for utilities such that they can offer large-scale DSM² programs to industrial as well as commercial and residential customers at a profit. This effort should include *decoupling revenues from sales*.
- Creation of large funding resources for these programs. American DSM programs have achieved about 4 kWh/yr of savings for each US dollar of public money invested in DSM; this is 4 kWh per year continuing for 5 (or even 50) years for each dollar spent ONCE. (The dollars include administration and informational programs to which savings are not credited even though they are believed to occur. So this is about 1 to 1 1/2 cents of present value per kWh saved—which is cumulatively enormous. China should size its DSM budgets commensurately with this, given the role that electric efficiency must play in meeting the 20% target. This calculation will yield a very large budget compared to existing programs. However, the relative size of the budget compared to overall utility revenues will be smaller than 5% even after several years of growth.
- Clarifying the legal authority of utilities to operate large-scale DSM programs.
- Better enforcement of existing building energy efficiency codes.
- Expansion of bus-based mass transit systems; and construction of bus rapid transit systems.

¹ Equipment means a wide array of products such as home appliances, automobiles, furnaces and boilers, consumer electronics and computers, water heaters, lamps and ballasts, motors, air conditioners, refrigeration systems such as those used in retail food stores, and any other product that is mass-produced and used in similar enough ways that a laboratory test procedure can be implemented to measure the typical annual energy use. In the United States as a whole as well as in some individual states, and also in Europe and Japan, dozens of types of equipment are subject to efficiency test protocols, and in most cases, also mandatory performance standards.

² “DSM” or “demand-side management” is a utility industry term referring to programs that reduce energy demand through efficiency at the utility customer level.

- Construction of bicycle transportation facilities, such as grade-separated rights of way and secure storage facilities, that provide safe conditions that minimize conflicts with motorized vehicles.
- Tax policies and plans to accelerate sectoral shifts in industry away from basic commodities and toward secondary and tertiary industry. This is a shift that would naturally accompany a maturing economy and leads to greater job creation and better long-term economic growth.
- Financial incentives for the production of renewable energy, based on the electric or fuels output of the project, and declining over time.
- Public information campaigns on energy efficiency and energy-conserving behaviors. Such campaigns can, if well researched and conducted with seriousness, have a significant effect on reducing energy use in the short run. ***But they are unlikely to be successful unless the steps recommended above are taken first.***

These policies complement and support longer-term policies, particularly:

- Energy code upgrades on a regular schedule so that China's efficiency requirements approach global best practices.
- Increased breadth and stringency for standards on appliances and equipment.
- Higher efficiency standards on lighting, including a total phase-out of incandescent lamps in favor of higher efficiency alternatives.
- Harmonizing standards and test protocols internationally.
- Encouragement of high-density new housing construction and discouragement of sprawl style housing.
- Construction of expanded metro and light rail transit systems.
- Empowering and requiring utilities to manage their portfolios in a way that minimizes lifetime costs for their customers and gives priority to energy efficiency and renewable energy resources.

The conceptual framework behind these recommendations is discussed in Section II. More details on specific policies are provided in Section III.

II. Constraints to Quick Action

A. Lead times for Efficiency Policies

Virtually all of the significant energy efficiency strategies require investment in more efficient products, equipment, building designs, or industrial processes. These investments

are not only long-term projects, but they also take a certain amount of time to design and construct.

Lead times must be considered as a framework for evaluating policies. Policy makers must focus their attention both on policies that can be effectuated with short lead times and on reducing the lead times of policies that could be implemented more or less quickly.. These lead times include the lead time from setting a policy to implementing it, and from implementing it to observing energy savings in the field. Time delays can also occur as infrastructures (capacities) of people and sometimes equipment needed to enforce energy efficiency policies are built up.

Some important considerations for China would be the lead time for building production capacity for efficient equipment and for the supplies needed to make buildings or industrial processes more efficient, based on products that are already mass produced in China. A similar question could apply to products that are mass produced elsewhere in the world and could be imported.

A second question would concern the lead times for taking products that are minimally-produced niche products and turning them into mass-produced products. This could be done either in Chinese factories or foreign factories.

The third critical lead time is the time it takes to built up the infrastructure of trained people who can administer the program. How quickly could sufficient program managers be trained to implement DSM on a much more massive scale? How quickly could the management capacity be built up to handle the supervision of the staff and to oversee the contractual payments of incentives to the utility customers for succeeding and implementing efficiency?

These are the sorts of questions that are addressed in Section III below, in the context of policies that can begin to produce significant energy savings after relatively short lead times.

Lead times become less and less of an issue as the infrastructures for developing and implementing efficiency get developed, particularly for human resources. Perhaps the best example of how a well developed infrastructure can lead to short-term energy savings is provided by the California energy crisis of 2000-2001.

B. How California used short-lead-time polices to avert an electricity shortage

California's proposals, beginning in 1992, to "deregulate" electricity led to a number of severe problems, which are discussed next. DSM turned out to be the cornerstone of a suite of policies that solved these problems in 2001.

In response to concerns and uncertainties over the potential for deregulating utilities, followed by the actual implementation of deregulation, virtually no new power plants were proposed or built between 1992 and 1999. Even with California's very slow growth in electricity demand (about 2% annually), imbalances between supply and demand slowly built up. These imbalances were exacerbated by the utilities' response to the uncertainties surrounding the policy change of restructuring--the utilities cut DSM budgets by 50%³--and

³ Both the failure of power plant developers to propose or construct new plants and the utilities' DSM budget cutbacks were rational responses to the deregulation proposals being debated. (This is why the proposals were so damaging.) For power plant developers, the unpredictable structure of the new power market made power

by a pause in the process of strengthening the state's energy efficiency codes for new buildings in the mid-1990's (which occurred for reasons unrelated to restructuring).

The California Energy Commission first realized that there was a potential for problems of electricity shortages in early 1999, less than 18 months before the problems manifested themselves in the marketplace.

Throughout the summer peak season of the year 2000, energy shortages, particularly at the peak hour, produced ruinously high wholesale prices in the newly deregulated electricity markets. These prices led to an incremental cost of electricity consumption of \$15 billion compared to normal prices. This is about US\$1,000 per household. The price increases at wholesale were not recovered by utilities at retail, due to the rigidities of the tariff regulatory system, and were big enough to bring the largest utility in the United States into bankruptcy and nearly bankrupt the second largest.

The magnitude of the crisis was predicted to be even worse for Summer 2001: some 40 days of rolling blackouts and \$40 billion of predicted excess cost for power. As a result of this crisis, the California government acted in Summer of 2000 to institute an emergency energy efficiency program. This program was funded by \$1 billion of state revenue that was raised for this purpose in late summer 2000.

The money was spent on a dramatic expansion of existing DSM programs and the development of new programs administered by state and local governments as well as utilities.

These programs were an outstanding success, reducing demand by about 5,000 megawatts, or over 10% of the previous year's peak. These reductions occurred despite hotter weather (more air conditioning load) and continuing economic and population growth. They were sufficient to entirely eliminate the problems of supply/demand imbalance during the summer of 2001: there were no rolling blackouts and no excess costs for electricity. (Economic growth was slowing that year—probably in the 1-2% range—but was positive.)

How was this able to be done? The critical factor is that there were existing DSM programs that could be scaled up, and an administrative infrastructure that could handle the expanded and new programs in a businesslike way. It was not necessary to train key managers from a standing start, nor was it necessary to develop new business relationships between government agencies and utilities on one hand and utility customers on the other hand. Producers of energy efficiency equipment and designers of energy efficiency processes (such as the improved industrial production processes that were energy efficient, or designers of efficient lighting systems for public buildings) had some 6-months' warning (late summer through early 2001) to prepare for the programs by ramping up production of efficient products and by hiring enough people to install them.

California's DSM programs were supplemented by an array of other activities. The state funded a public information and outreach campaign explaining the importance of energy

plant investments too risky—it would be impossible to predict the resulting costs of power. For distribution utilities possibly facing retail competition, DSM expenditures would result in (slightly) higher tariffs, leading to a perception that the utility would be facing new retail competition that could steal customers by offering lower tariffs. This problem could be avoided by structuring DSM budgets as fees that are collected on all retail electricity sales, but uncertainty over whether or not that solution would be implemented led to the reduction of DSM budgets.

efficiency and also of energy conservation—short-term behavioral changes that save energy and peak power. This campaign found it relatively easy to get public attention: the power shortage was in the news because of the rolling blackouts the previous year and because of the headlines about the immense costs being paid for power and the threat that they would get even more burdensome the next summer without action. This campaign, which has focused subsequently much more on efficiency, can be seen at: <http://www.fypower.org/>.

This information campaign was backed by a tariff incentive program called 20-20. Every residential electric customer that reduced their consumption in kWh by 20% compared to the same month the previous summer received a tariff reduction of an additional 20% that month.

These programs—DSM, information, and 20-20, all reinforced each other. The utilities could promote participation in DSM programs not only on the basis of the direct savings, but also on patriotic sentiment, and also on the ability to qualify for the special 20% tariff reduction.

California also conducted an emergency rulemaking to upgrade the stringency of its building standards. This was accomplished in about one year, compared to the usual time period of three years. Nevertheless, there are administrative lag times between Energy Commission adoption of a code and its publication as a state building code. There are regulations that provide a fixed lead time, usually one year, between the publication of a building code and its implementation. And the implementation refers to the date that the building is actually permitted, rather than constructed. In the case of residential buildings, which are built in large subdivisions, the delay between obtaining a permit and building a home can be 6-18 months. For commercial or public buildings, the construction times can range from 2-4 years.

California similarly embarked on a program of increasing its equipment efficiency standards for some 2 dozen products. But, the lead times for these standards are required by law to be at least 1 year and are often 3 years or more in order to allow manufacturers sufficient time to ensure that all of their products to be able to meet the new standard.

Thus, while codes and standards may be the largest single producer of energy efficiency savings in the long term, they can do relatively little within a 4-year time period.

What are efficiency policies that can act fastest? The next section reviews what some of these policies are.

III. Policies for Producing Short-Term Energy Savings

A. Provision of performance-based financial incentives for advanced levels of energy efficiency in buildings and equipment

Incentives are perhaps the most effective means of inducing short-term energy savings because they are not mandatory. That is, they do not require that changes be made in *all* products or *all* buildings.

A standard for energy efficiency has to be set at a level that all products or building designs can meet it. In practice, politically, the level of efficiency demanded must be low enough that almost everyone can meet it at modest cost. This constrains both the stringency of the demand and the amount of time that has to be allowed in order to avoid adverse impacts on the slower moving companies within the market.

Financial incentives do not face this liability. A financial incentive can be set at a desired high level of performance without regard to what fraction of the market can comply. Designers that are nimble enough to take advantage of the incentive can do so at an economic benefit as well as a social profit. The ones that cannot are no worse off than they would have been without the policy. The experience that America has had on financial incentives suggests that manufacturers and designers can gear up very quickly to respond to new programs.

The U.S. Congress enacted legislation in August 2005 that provides financial incentives for efficient buildings and equipment. We already have fragmentary data suggesting that the chosen levels of efficiency – which were far tougher than the top one percentile of products and buildings currently in the market – are being met by a rapidly increasing number of products.

More extensive experience can be found for programs with narrower scope. The point of national-level financial incentives is to provide multi-year assurances that their investments in dramatically-improved energy efficiency can pay off—that they can rely on several years of marketing assistance in the form of the incentive. This will allow them to plan on being able to sell enough product for enough years to pay off their investment in mass-producing it. Manufacturers, in their dialogue with utilities, have emphasized the need for national consistency and multi-year commitments to make the more ambitious DSM programs work.

American utilities have attempted to meet these criteria by offering multi-year programs that are identical from utility to utility. The weakness of these programs is that, throughout the historic record of such programs, no single utility could make a financial commitment for more than a year or two⁴; and also that the programs cover less than half of the whole United States at best, and often as little as 15% or 20% of the U.S. population. Yet, notwithstanding these problems, programs for highly efficient air conditioners, clothes washers, and dishwashers, among other products have drawn forth substantial amounts of supply with a lead time of as little as 4-8 months. Typically, programs announced by November or December of a given year can bring forth supplies of efficient products at the level of 20-30% market share by the next summer.

*China could establish national tax incentives based on building energy performance using the U.S. proposed legislation S. 3628 as a conceptual model.*⁵ A conceptual description of the bill is found in Appendix D of NRDC's report, "Best Practices for Energy Efficiency Incentives and Their Role in Energy Policy: A Report to The China Sustainable Energy Program for Decisionmakers in China" (Goldstein, 2005).

Many of the elements of this bill are simply multi-year extensions of the provisions of U.S. law enacted in 2005 concerning incentives. The levels of performance in this bill are very high compared to the state of product availability in the United States, so China could be assured that an identical program would not be too expensive. It would also be possible for China to offer a lower tier of incentives for products and buildings at level of efficiency that are more appropriate for China's market.

⁴ As of 2006, California allows three-year programs, but the record of such programs has yet to be observed.

⁵ The text of this bill can be found at: <http://thomas.loc.gov/> where the user should look for the box "Search Bill Text" and click on "Bill Number" and then type in S. 3628.

B. Reform the regulatory structure for utilities so that they can profit from successful DSM

DSM is one of the cornerstones of a long-term energy policy. California has estimated that over 40% of the energy efficiency that it has acquired through policy initiatives has been due to DSM. But DSM is even more important in the short term.

DSM programs, as soon as they are announced, allow manufacturers to gear up the supplies of energy efficient products that would not be sold without the service. While the savings from these programs are not as large in percentage terms (that is, in the percent of energy saved by the measure) as the national financial incentives, the market share can be significantly higher, so the overall first-year kWh and kW savings can be larger. Many utility programs in the United States have achieved market shares of 20% to 60%, even during the first year of operation.

China has great opportunities to develop energy efficiency quickly through expanding DSM programs.⁶ The opportunities span all of the sectors: residential, public buildings, and industry.

The key lead time issue here is likely to be building up the management and personnel infrastructure of utility staff that can operate these programs. This should not take as long in China as it took originally in the United States because some of the leading utility companies currently operating successful programs, such as Pacific Gas and Electric, which is a member of the China/U.S. Energy Efficiency Alliance, are willing to train Chinese utility staff on how to operate and manage programs.

But the level of potential savings from DSM is orders of magnitude larger than what has been contemplated to date, so serious effort should be focused on building up the human infrastructure needed to operate and supervise greatly expanded and rapidly growing programs.

A particular constraint on the utility sector involves industrial energy efficiency. Industrial programs that are most successful tend to be tailored to the individual needs of a particular production facility. Utility DSM program managers will need access to staff or engineering consultants who can analyze the potential for efficiency improvements in the customer's facility and technical advice as well as financial assistance to getting these projects implemented. China needs to develop processes to minimize the lead time in building up this resource.

As mentioned in Section I, successful expansion of DSM programs will require a receptive regulatory and legal environment.⁷ This entails three changes in regulation:

-

⁶ David Moskowitz. "Meeting China's Energy Efficiency Goals Means China Needs to Start Building Efficiency Power Plants". Regulatory Assistance Project, November 2005.

Zhaoguang Hu, David Moskowitz, Jianping Zhao. "Demand-Side Management in China's Restructured Power Industry". Regulatory Assistance Project, December 2005.

⁷ Bachrach, D., S. Carter and S. Jaffe, "Do Portfolio Managers Have An *Inherent* Conflict of Interest with Energy Efficiency?" *The Electricity Journal*, Volume 17, Issue 8, October 2004, pp. 52-62.

- Decoupling revenues from sales
- Allowing utilities to fund DSM program expenses from tariffs
- Providing an incentive to utilities for cost-effective energy savings realized through DSM programs.

Establishing budgets and the economic will to increase the size of DSM programs is the necessary first step toward realizing the immense potential for energy savings and economic growth that can be provided by DSM. Managing the explosive growth of this activity is the next challenge. The sooner these are initiated, the more DSM can contribute to the 2010 goal.

C. Better enforcement of existing building energy efficiency codes

One of the barriers to achieving energy efficiency in new buildings is the insufficiency of resources that are being devoted to enforcing China's existing energy efficiency standards for new buildings. In the United States, experience has shown that it is necessary to plan check and field check 100% of all new building permits in order to assure compliance with the code. Similar situations are found in Russia, Kazakhstan, and Ukraine, where energy codes are enforced on the basis of 100% inspection, both of plans and of buildings as constructed.

In contrast, in China, even the most advanced provinces seldom inspect more than 20% of buildings, and these inspections may not include both plan checks and field checks.

The primary constraint to changing the system is training the increased number of officials (or private sector inspectors) required to do the enforcement. Such a training program should also be focused on the construction sector actors who must comply with the code—architects, engineers, construction companies and their workers, etc. This activity could be accomplished relatively quickly, and would greatly improve compliance with existing codes.

There is already considerable experience internationally in creating more private sector inspectors. The system for quality assurance in the U.S. is the non-profit organization RESNET (see www.resnet.us). The European Union has required that beginning in 2006 all buildings must be rated for energy use. This will cause the development of a significantly expanded inspection infrastructure in Europe over the next several years.

This is an important long-term measure as well. China's energy codes are still significantly less demanding than those of the United States, the European Union, or Russia. But, it is not possible to upgrade the existing codes until the building industry complies with what is already there.

D. The expansion of bus-based mass transit systems

Greater availability of public transportation has been found to *reduce the total amount of travel* that people need to do as well as allowing people who would otherwise use private automobiles to use mass transit. The benefits of transit traditionally have been underestimated—it has been assumed (without empirical evidence) that enhanced transit services do not affect total travel demand—and it is only recent research that is beginning to document the magnitude of the benefits of transit availability.⁸ In the case of China,

⁸ Some of the research sources are cited in "Overcoming Barriers to Smart Growth: Surprisingly Large Role of Better Transportation Modeling," Goldstein, David B., J.Holtzclaw, T. Litman. Proceedings of the 2006

improved mass transit can reduce the growth in use of private automobiles. Thus, savings may be hard to measure (since automobile use will continue to grow), but the savings are real nonetheless.

Short-term measures should focus on the expansion of bus-based systems because rail systems and metros take much longer to construct. Cities such as Bogota, Columbia have constructed bus rapid transit systems in less than 36 months. Buses are manufactured in many places throughout the world and so the lead time for ordering buses can be shorter than it might be for railroad equipment. The Bogota bus rapid transit system is very successful, producing over a million passenger trips daily in January 2006, less than 6 years after the system first commenced partial operation.

Note in the case of Bogota that the fraction of travel accomplished by non-motorized means increased after the system was opened. The system achieved the same level of transportation capacity as a rail metro system but at less than 10% of the cost.

E. Construction of bicycle transportation facilities

Separate rights of way for bicycles can be constructed quickly compared to other transportation infrastructure improvements. Even in the United States, measurable and quantifiable reductions in increases in the market share of bicycling have been observed as a consequence of the provision of grade separated bicycle infrastructure.⁹

Accompanying infrastructure, including secure bicycle parking facilities and showers for users who need to bike long distances in hot weather, are part of green buildings credits in LEED™ and similar systems. A system that supports bicycles can enable bicycles to achieve market shares of some 20% in developed countries.

F. Encourage sectoral shifts away from basic commodities

According to research at Lawrence Berkeley National Laboratory, much of the recent (post-2000) degradation of energy-to-GDP ratio in China has come because of the rapid growth of primary industry: industries like the production of bulk aluminum, cement, etc. This is a reversal of the trends of the previous 20 years. In addition to policies that encourage all industries to be as energy efficiency as possible, China should look at tax or import/export policies that would encourage the development of higher value-added and lesser energy-intensive industries.

The economic development potential of basic energy intensive industries appears fairly limited. These plants generally do not employ very many people, and many of the plants could locate anywhere in the world. China could investigate whether some such plans are located in China due to quirks of taxation or regulatory policy rather than fundamental economic motivations.

Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington, DC, August 2006.

⁹ See Victoria Transport Policy Institute. TDM Encyclopedia. "Cycling Improvements: Strategies to Make Cycling Convenient, Safe and Pleasant." 2005. <http://www.vtpi.org/tdm/tdm93.htm>

China should also look into incentives to discourage excessive use of energy-intensive materials. Most Chinese buildings, for example, appear to be constructed based on a load-bearing post and beam system. Walls in such construction serve the function of keeping out the weather and not of structural support for buildings. Yet, most observable construction practice in China uses bricks or other heavyweight material. This is wasteful of the embodied energy in the material and also wasteful of transportation energy to haul the construction supplies from the production facility to the construction site. It also degrades the energy performance of the building since heavy weight masonry materials are more thermally conductive than most other alternatives.

China could achieve significant improvements in building energy efficiency as well as reductions in industrial energy use by encouraging walls made primarily of insulation and weather-proofing materials. This change could be accomplished quickly through policies to encourage the production and use of wall systems that are more energy efficient and use smaller amounts (weight) of basic materials.

G. Financial incentives for the production of renewable energy

Incentives to encourage renewable energy production have been effective in California, in several northern European countries, and in Japan and Germany for photovoltaic systems. The economic rationale for such incentives is that by encouraging more widespread use of new technologies for renewable energy and fuel production, the state can both increase returns to scale and cause additional cost reduction through the learning curve effect.

Renewable technologies that are not yet cost-effective can become so after the financial incentives create a serious industry. A country that supports renewable energy production can create a domestic industry that can sell energy systems for export as more countries turn to renewables.

Countries such as Japan and Germany have provided incentives that automatically decline over time, recognizing the importance of learning curve and returns to scale. Other jurisdictions such as California have incentive programs in which resource developers bid against each other for the least amount of requested subsidy. This also drives down cost.

H. Public information campaign

Part of California's success in the year 2001 was due to reliance on patriotic sentiment, expressed through advertising and public relations campaigns, to improve energy savings practices as well as to install more efficient equipment. State, local, and national governments have been providing information and encouragement on energy conservation for over 25 years, none of which has been documented to have had much success. But the California program worked because of widespread public awareness of the importance of energy savings, particularly in the short-term. The program also benefited from much more accurate and usable information than previous programs. One of the focuses of the California program was a clear distinction between (1) operational changes that can save energy but require constant attention and may degrade comfort or convenience somewhat, and (2) investments in energy efficiency, which require a more serious financial commitment but which maintain or improve energy services while saving money.

IV. Integrating Short Term Measures into a Comprehensive Energy Policy

All of the measures described in Section III work most effectively when they are integrated into a long term energy strategy.

The integration works differently for policies based on improving the efficiency of products, buildings, and industrial processes than it does for increasing the efficiency of the urban infrastructure in order to reduce transportation energy use and cost.

For products and buildings, the short term strategy is to increase the production and sales of the highest-efficiency products and designs currently available, relying most heavily on financial incentives. Over the long term, this strategy needs to be integrated into a plan that relies on codes and standards for the bulk of the savings and that encourages continuous improvement in technology.

This long-term approach uses the lowest-cost policy interventions to acquire the basic levels of efficiency that should be used everywhere. These are standards or codes and normative labels. Financial incentives are used to encourage technologies that are too new or too costly to require everywhere or those that only work well in some circumstances. This combination is described in two NRDC reports to the Energy Foundation, “Best Practices for Energy Efficiency Incentives and Their Role in Energy Policy: A Report to The China Sustainable Energy Program for Decisionmakers in China” (Goldstein, 2005) and “Transforming Chinese Buildings” (Goldstein and Watson, 2002)

The combination of codes and standards with other policies provides a mechanism to promote continuous improvement of technology. As new technologies are developed, new higher tiers of incentive qualification are adopted. As these levels begin to gain market share, incentives for the lower levels are eliminated, and these technologies can be incorporated into standards and codes (or in the best case, they will become normal practice without the need for formal requirements).

The combination rewards industries and designers for finding and commercializing higher levels of efficiency than were predicted by government or utility policy-makers. It allows new levels of efficiency to qualify for competitively attractive incentives that allow the technology to be marketed.

The long term approach described in this Section applies to buildings, appliances, equipment, and automobiles.

It applies indirectly to industrial processes, since the utility regulatory reforms that support DSM also support continued utility involvement in modernizing and improving industrial processes.

For transportation energy use, the short term policies of constructing new bus services and bicycle infrastructure can be supplemented by longer term policies of providing better infrastructure for non-automobile travel modes (walking, bicycles, metro expansion, light rail, high speed intercity rail, etc.).

Research in the U.S. and other developed countries has found that the most important urban design parameter that allows reduced automobile usage is higher density of development: larger number of housing units per hectare of residential land use. China traditionally has favored high density housing. But this tradition is eroding in some areas. Municipal land use

plans and developers should be encouraged to continue and improve upon traditional practices of high density housing.

Transit service levels are the next most important determinant of how much travel by car can be reduced. There is a strong correlation between the number of buses or train cars serving a station within walking distance¹⁰ of housing each hour and the number of kilometers of automobile travel that is reduced.

There is some evidence that mixed land uses (for example offering retail space in residential developments or including some housing in office centers) reduces driving. Designing land use at the smallest levels to make walking and bicycling convenient and safe also has been shown to reduce automobile use. And obviously building housing close to centers of employment cuts transportation needs.

Land use planning and development are thus the cornerstone of a long term strategy for energy efficient towns and cities. They are particularly important factors for China because China can anticipate strong migration from the countryside to the cities over the next 50 years. After that, patterns will become well established and change will be more difficult.

The next most important long term policy is planning for much better transit and bicycle access. Bus expansions and new bicycle infrastructure are the only practical improvements for short run energy savings, but over a 10 or 20 year period a broader array of options should be studied. Improved transportation planning models that correctly account for the influence of density and transit service on auto ownership and on total travel demand can allow a cost-effective comparison of different mixes of rail, bus, and bicycle facilities.

V. Summary

China has set an ambitious short term goal for energy efficiency improvements. Policies that focus on the short term can help achieve that goal. These policies are part of a more comprehensive set of recommendations for a long term approach that advances economic development and environmental protection.

¹⁰ "Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles and San Francisco. John Holtzclaw, Robert Clear, Hank Dittmar, David Goldstein, and Peter Haas, *Transportation Planning and Technology Journal*, Volume 25, Number 1 (March 2002). Note that walking distance is defined as 500 m for a bus stop and 1000 m for a train station.

IX.

Implementation of the Renewable Energy Law: Practice and Concerns

Wang Zhongying
Director, Center for Renewable Energy Development
Energy Research Institute

I. Renewable Energy Law Implementation Framework

The *Renewable Energy Law of the People's Republic of China* (RE Law) was adopted at the Standing Committee of the Tenth National People's Congress (NPC) on February 28, 2005. In January 2006, the National Development and Reform Commission (NDRC) released three important documents: *National Renewable Energy Industrial Development Guidance Catalogue*, *Administration of Renewable Energy Power Generation*, and *Rules for Renewable Energy Generated Electrical Pricing and Cost-sharing Management*. In July 2006, the Ministry of Finance also promulgated the *Provisional Measures for Administration of Special Funding for Developing Renewable Energy Resources*. Meanwhile, the *National Medium and Long Term Renewable Energy Development Plan*, formulated by NDRC, entered the final approval stage by the State Council. In connection with the renewable energy-generated cost-sharing measures, NDRC issued the "0.1 fen increase" policy on July 1, 2006 to support renewable energy power generation. Thus, the implementation details, rules, and basic conditions of the RE Law were put into place, ensuring that the law was ready to take effect in January 1, 2006.

The overall framework for the development of national renewable energy has been established, the state has formulated national renewable energy development goals, and specific measures have been implemented through national and provincial renewable energy development plans. The state has decided on the grid-connected price for renewable energy power generation, and has required power companies to purchase all electricity produced by administration-approved or listed renewable plants, based on the grid-connected price and on the winning bid for project tendering. The grid-connected price of power generated by renewable energy is higher than conventionally generated energy; the extra costs incurred because of mandatory grid connection must be shared by national grid end-users.

Although the RE Law has is in effect, renewable energy technologies and supporting policies for development and utilization vary in strength, and some policies are unclear with regard to implementation. For example, there is a need to clarify the effectiveness, policy strength, and operability regarding the development and utilization of solar energy, geothermal energy, and ocean energy, as well as non-power generating renewable energy. Many problems still exist that need to be solved in connection with implementation of the RE Law.

II. Effects and Problems in Implementing the RE Law

Nearly one year after the implementation of the RE Law, we can see that on one hand a wave of renewable energy development and utilization has been created, with particular eagerness for rapid returns from both wind energy and biomass energy; in some regions, this market may even be saturated. On the other hand, the results of implementation of the law have not been satisfactory, and China has failed to bring about large-scale renewable energy development and utilization. On the whole, China has not laid a solid enough foundation for

comprehensive development and utilization of renewable energy; we are not fully prepared for the rapid developments in this sector.

At present, the problems with renewable-related technology and R&D systems are the biggest obstacles for renewable energy development. For example, with regard to the development of wind power, available resources have not been qualified, grid construction is lagging, and technology (wind-powered electric generators) is falling behind; regarding biomass energy, the market has become volatile, due mostly to resource uncertainty. There also exists the challenge of coordinating ecological problems (biological diesel and cassava-based ethanol) with the State's development strategy. Because of limited resources, we must carefully consider whether biomass should be used mainly for power generation or as a petroleum substitute; after all. Furthermore, due to the lack of reporting and supervision mechanisms, specific projects have yet to be carried out for the renewable energy cost-sharing policy, which has not yet been implemented.

In fact, various renewable resources have particular characteristics in terms of both development and utilization. According to the type and source of resources, the energy may be a direct result or a by-product of utilization. For example, with the treatment and utilization of industrial and agricultural organic wastewater and urban organic garbage, energy is the by-product. There are many kinds of renewable resources, including water energy, solar energy, wind energy, biomass energy and ocean energy.

The development and utilization of such resources involves various governmental administrative departments. For example, the development of biomass energy is not only under the administration of the relevant energy department, but there is also a close relationship with the agricultural and forestry departments. The top level administrative agencies of the State Council include the National Development and Reform Commission, the Ministry of Agriculture, the State Environmental Protection Administration, the Ministry of Finance, the Ministry of Science and Technology, the Ministry of Construction, and the Forestry Bureau. The situation is similar in local governments. With so many departments involved in the administration of renewable energy development and utilization, there is no unified development goal, strategy, or unity and coordination, making it difficult renewable energy development. The formulation and effective implementation of the development plan, and the implementation and supervision of the RE Law, are all dependent on coordination and cooperation between the departments listed above.

In view of the fact that so many governmental administrative departments are concerned with renewable energy development and utilization, it would be beneficial if each department has clear responsibilities. With the multiple government entities involved in policy, lack of unification and coordination can prevent actual accomplishments, and the system may be prone to corruption or abuse.

1. Coordination and cooperation are crucial to the multi-department system

Because each type of renewable energy has its own characteristics, and is administered simultaneously by many governmental departments, inter-departmental coordination and cooperation is crucial. The prerequisite for robust renewable energy development in China is coordination and cooperation.

The state has not yet formed a coordinated force to support renewable energy development. Although the RE Law is already in effect, and despite the rapid increase in global oil prices, an extreme shortage of energy, and the widespread energy security crisis, renewable energy development in China is making very slow progress. The relevant energy departments under the State Council need to take the lead in coordinating and consolidating the implementation of the renewable energy development and utilization program and strategies. However, the interests of departments are being prioritized ahead of the interests of the state. For example, renewable energy resources are of the utmost importance for renewable energy development and utilization. Some of them come directly from natural resources (e.g., the wind and the sun), while others need to be developed. For example, biomass resources need to be planted and harvested, and its planting requires integrated planning and deployment, so that biomass production does not take place in grain-producing areas, nor in places that destroy forests or wetlands. Many needed measures exceed the current responsibilities attributed to particular departments, which need to take charge of resources, develop projects, and construct and manage biomass energy resources and biomass liquid fuel processing plants.

2. Technical R&D and market utilization of renewable energy are seriously disjointed

One of the major problems causing a bottleneck in renewable energy development is the issue of technologies having independent property rights. The wind power industry must deal with wind turbines, and the solar power industry deals with silicon materials. The auto industry has been sold to foreign enterprises, but China must ensure that it has its own technical products as well, such as large-scale thermal generator divisions and hydroelectric power divisions. According to the current national renewable energy development targets set for 2020, renewable energy will be a RMB 2 trillion market (2005 prices). If we don't have world-class domestic technologies, this RMB 2 trillion cake will be swallowed up by foreign enterprises.

In addition, our scientific research system has certain problems: those in charge of technical R&D are not concerned about the industry itself, and those in charge of industrial development have no assets to deal with the technology, thus causing serious discrepancies between the technical R&D and market utilization divisions within the renewable energy sector. Experiences in the U.S. with renewable energy technical R&D and market utilization could serve as a reference for China. In the U.S., the Department of Energy is affiliated with the U.S. State Department, which is the administrative department for the state's energy technology, R&D, and industry. At the early stages of technology development, energy enterprises are involved and invest funds, which is added to the R&D funding invested by the state. Then, when a technology has been successfully developed, it is immediately applied to the energy industry. China has followed this successful strategy in the development of large-scale thermal generators and hydroelectric generators, with technical R&D closely tied to industrial application.

3. Difficulties with enforcement and inspection in implementing the RE Law

Because there are so many renewable energy-related administrative departments, the leading and coordinating functions of the state's renewable energy administrative departments and their authoritative status have not received proper approval and recognition. Although the RE Law has begun implementation, the functions and roles of the individual departments lack unity and coordination, and it is difficult for them to perform their own responsibilities according to the regulations of the RE Law. The enforcement and inspection abilities of the

NPC also lack an appropriate means of punishment. Therefore, law enforcement inspection and supervision after implementation of the RE Law are confronted with numerous difficulties.

4. Open and transparent legal implementation mechanisms are lacking

In regards to implementation of the RE Law, it is clear that open and transparent legal enforcement mechanisms are needed. Such mechanisms apply to decisions concerning the overall renewable energy goals and development plans, pricing, project approval, and project tendering organization. In accordance with the principles of transparency and efficiency, we should seek public opinion, promptly release relevant decisions, and publicly report on activities and progress. Except for the franchised tendering of wind energy projects, numerous renewable energy-related administrative activities currently lack openness and transparency.

III. Further improvement on the Implementation of the RE Law

Currently, many implementation measures and details concerning renewable energy development are not as good as they should be. Without a lasting development strategy, the state is unable to properly guide the development of the renewable energy industry. Although it is difficult in a short period of time to make substantial changes to China's current scientific research and industrial supervision system, we can nevertheless seek to solve certain key problems, strengthen the detailed rules concerning implementation of the RE Law, and promote its improvement.

1. Formulate the overall development strategy, then research and implement the technological route to renewable energy development

Currently, renewable energy development lacks established policies and full utilization of natural resources and technologies; in addition, many plans remain inoperable and development prospects are unclear. In fact, each renewable energy technology has unique and objective rules for development, so the many failures and lessons, as well as successful experiences, in the rest of the world may serve as references for us. As it stands, we need policies to be fully put in place, and we need to implement the state's overall renewable energy goal and plan, yet we still have no clear path to follow. Therefore, by formulating the development route for renewable energy technologies in such sectors as wind power, biomass energy and solar energy, we may be able to clarify the technological path for renewable energy development, and we may be able to resolve problems. For example, with respect to wind power development, we need to solve the problems of resources, power grid, wind turbine manufacturing and industrial development. Through studying and formulating the development path for renewable energy technology, and promoting clear practices and incentive measures in detailed and legally-binding implementation rules, we can formulate realistic policies and measures for supporting the development of renewable energy.

2. Improve the operational mechanisms for renewable energy-related cost-sharing implementation

The implementation and realization of renewable energy development goals are embodied by the individual projects currently underway. Compared with conventional energy, renewable

energy development and utilization costs are high. In order to address this imbalance, a renewable energy cost sharing mechanism has been established, giving support to the development and utilization of clean energy, guaranteeing energy security as well as protecting the environment. The RE Law has been in effect for almost one year, but the cost sharing mechanism has not been implemented for all new projects, and this is unfavorable for the sustainable development of renewable energy projects.

The basic conditions for the cost-sharing mechanism have been put in place, but details regarding implementing the cost-sharing mechanism, and other specific measures, need to be clarified. Details are currently needed regarding how to declare subsidies for new projects, how to regulate the surplus and deficiencies among power grid companies, whether central and local projects both receive equal treatment, and whether the Electricity Regulatory Commission will supervise such specific operational processes. All such problems need to be clarified through rules on specific cost-sharing implementation and operations. Only in this way can we inspire greater enthusiasm amongst enterprises, take advantage of government efforts to develop the renewable energy market, encourage market entry, and promote renewable energy development.

3. Establish a supervision mechanism to implement the RE Law

In order to effectively implement the RE Law, two additional tasks need to be carried out: first, we need to research and formulate relevant administrative rules and regulations, and technical standards and local codes; second, we must gradually establish and improve implementation capacity, which involves government management systems, market-oriented mechanisms and a system for public supervision.

As a result of the efforts of the NPC and the State Council, as well as those of people from all sectors of society, the formulation of relevant administrative rules, regulations, and technical standards, has already begun. However, the corresponding implementation mechanisms still have not elicited sufficient attention. Since the implementation of China's renewable energy program involves many different government departments, the energy system and pricing mechanisms are in the process of transformation, and public participation and societal supervision are still very weak.

The NPC should establish legally binding supervision mechanisms, promote the creation of favorable governmental administrative systems, market system, and social supervision mechanisms, to guarantee the effective implementation of the RE Law. It should push the government to establish and improve systems for government transparency with regard to planning, project approval, and pricing, and should ensure that people from all sectors of society are able to understand the government's decision-making information in a timely manner, giving the public opportunities to be involved in the decision-making process. It should also establish a regular appraisal and reporting system for the implementation of the RE Law. The State Council and provincial power administration departments should regularly report on implementation of the RE Law to the standing committee of the People's Congress of the same level, and to make this information public.