## Eighth Senior Policy Advisory Council Meeting

# TAX AND FISCAL POLICIES TO PROMOTE CLEAN ENERGY TECHNOLOGY DEVELOPMENT

**November 18, 2005**

**The Great Hall of the People**
**Tiananmen Square**
**Beijing**
**P.R. China**

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3. Project Updates

## Additional Materials on CD

1. *Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges,* by The National Commission on Energy Policy

2. *Fiscal Instruments for Pollution Control: Attractions, Limitations, and Strategies,* by Lawrence H. Goulder, Department of Economics, Stanford University; Resources for the Future; NBER

3. *Energy and Environmental Tax Models From Europe and Their Link to Other Instruments for Sustainability: Policy Evaluations and Dynamics of Regional Integration,* by Dörte Fouquet, Senior Partner, Kuhbier Law Firm, Brussels; and Thomas Johansson, Former Energy Program Director, UN Development Program; Director, International Institute for Industrial Environmental Economics, Lund University

4. *Tax and Fiscal Policies for Promotion of Industrial Energy Efficiency: A Survey of International Experience,* by Lynn Price, Christina Galitsky, Jonathan Sinton, and Stephane de la Rue du Can, Lawrence Berkeley National Laboratory

5. *Integrated Resource Planning in the Context of China's Electricity Situation,* by Peter Bradford, Former Commissioner, U.S. Nuclear Regulatory Commission; Former Chair, New York Public Services Commission; Senior Energy Advisor

6. *Best Practices for Energy Efficiency Incentives and Their Role in Energy Policy: A Report to the China Sustainable Energy Program for Decision-makers in China,* by David Goldstein, Energy Program Director, Natural Resources Defense Council

7. *Trends in Energy Efficiency Investments in China and the US,* by Jiang Lin, Lawrence Berkeley National Laboratory

8. *Evaluation of China's Energy Strategy Options*, by Jonathan Sinton, Lawrence Berkeley National Laboratory

9. *Review of Penalties for Violations of Environmental Statutes in Selected Countries*, by Jonathan Sinton and Mark Levine, Lawrence Berkeley National Laboratory

# CHINA SUSTAINABLE ENERGY PROGRAM

# 8TH SENIOR POLICY ADVISORY COUNCIL (PAC) MEETING

## TAX AND FISCAL POLICIES TO PROMOTE CLEAN ENERGY TECHNOLOGY DEVELOPMENT

**NOVEMBER 18, 2005**
**THE GREAT HALL OF THE PEOPLE**
**BEIJING, P.R. CHINA**

## AGENDA

8:30 am **WELCOME REMARKS**
*Colburn S. Wilbur,* Chair, Senior Policy Advisory Council, and Trustee, The David and Lucile Packard Foundation

8:35 am **INTRODUCTIONS: NEW PAC MEMBERS**
*Lou Jiwei,* Vice Minister, Ministry of Finance (MOF)
*Qiu Baoxing,* Vice Minister, Ministry of Construction (MOC)
*Pan Yue,* Vice Minister, State Environmental Protection Administration (SEPA)
*Chen Yuan,* Governor, China Development Bank (CDB)

## PART ONE: UPDATE ON ENERGY POLICY DEVELOPMENT

8:50 am **SUMMARY: TAX AND FISCAL POLICY FORUM**
*Chen Qingtai,* Development Research Center (DRC)
- Ministry of Finance (MOF) Recommendations
- National Development and Reform Commission (NDRC) Recommendations

**SUMMARY:**
*Steven Chu,* Nobel Laureate, Physics; Director, Lawrence Berkeley National Laboratory

9:30 am **CHINA'S ENERGY DEVELOPMENT STRATEGY**
*Zhou Dadi,* Energy Research Institute, NDRC

9:55 am **WHAT CAN WE LEARN FROM THE U.S. ENERGY POLICY ACT?**
*Susan F. Tierney,* Former U.S. Assistant Secretary of Energy; Managing Principle, Analysis Group, Inc.; Chair, The Energy Foundation

10:10 am **REPORT ON THE U.S. NATIONAL COMMISSION ON ENERGY POLICY**
*William K. Reilly,* Former Administrator, U.S. Environmental Protection Administration; President & CEO, Aqua International Partners

10:30 am **BREAK**

10:45 am **PAC MEMBER COMMENTS**

## PART TWO: UPDATE ON LAWS AND STANDARDS

11:00 am **UPDATE ON LAWS:**
**RENEWABLE ENERGY LAW IMPLEMENTATION**
*Wu Guihui,* Deputy Director, Energy Bureau, NDRC
**ENERGY CONSERVATION LAW AMENDMENT**
*Zhao Jiarong,* Director General, Department of Resource Conservation and Comprehensive Utilization, NDRC

11:40 am **UPDATE ON STANDARDS:**
**FUEL ECONOMY IMPLEMENTATION; NEW STANDARDS FOR LIGHT-DUTY TRUCKS**
*Zhao Hang,* Deputy Director, Auto Standardization Research Institute, China Automotive Technology and Research Center (CATARC)

12:00 noon **PAC MEMBER COMMENTS AND DISCUSSION**

12:30 pm **LUNCH**

## PART THREE: YEAR-AHEAD AGENDA

2:00 pm **PROVINCIAL AND LOCAL IMPLEMENTATION CHALLENGES**
*Le Jingpeng*, Vice Chairman, Shanghai Economic Commission

2:20 pm **ADDRESSING INDUSTRIAL EFFICIENCY**
*Marie Pender,* Head, Climate Change Agreements, Department of Environment, Food, and Rural Affairs, UK

2:40 pm **EUROPEAN CLEAN ENERGY TECHNOLOGY TAX AND FISCAL POLICY LESSONS**
*Thomas Johansson, Former Energy Program Director, UN Development Program; Director, International Institute for Industrial Environmental Economics, Lund University, Sweden*

3:00 pm **BREAK**

3:15 pm **PAC MEMBER COMMENTS AND DISCUSSION**

5:45 pm **CLOSING REMARKS**

*Colburn S. Wilbur,* Chair, Senior Policy Advisory Council, and Trustee, The David and Lucile Packard Foundation

6:00 pm **ADJOURN**

6:20 pm **VISIT AND RIDE ON BEIJING BUS RAPID TRANSIT SYSTEM**

7:00 pm **CLOSING BANQUET**

## CHINA SUSTAINABLE ENERGY PROGRAM

# 8th Senior Policy Advisory Council Meeting
# November 18, 2005

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Chen Qingtai is Vice Minister of the State Council Development Research Center, a member of the China Monetary Policy Committee, Deputy of the National Congress of the Communist Party of China, and a member of the Standing Committee of the 10th China People's Political Consultative Conference (CPPCC). He has extensive macro-economic management experience in both the private and public sectors. In the private sector, he has served as Chief Engineer, President, and Chairman of China No. 2 Automobile Works, Chairman and General Manager of the United Company of Dongfeng Auto Industry, and Chairman of Shenlong Automobile Company. He is also currently Independent Non-Executive Director of Sinopec Corp. In the public sector, he has served as Deputy Director of the State Council's Economic and Trade Office, and Deputy Minister of the State Economic and Trade Commission. Mr. Chen is a graduate of Tsinghua University where he studied power and dynamics engineering.

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Lou Jiwei is Vice Minister of the Ministry of Finance. Mr. Lou has considerable experience formulating China's fiscal and monetary policy: he has served as Deputy Leader of the State Council's Working Group on Public Financial and Monetary Policy, Director of the Cost Price Division in the Chinese Academy of Social Sciences's Institute of Economy and Trade, Deputy Head of the Shanghai Commission for Economic Restructuring, and Director-General of the State Commission for Economic Restructuring's Macro Regulation Department. Mr. Lou has also been Vice Governor of Guizhou Province. He has a Master's degree in quantitative economics from the Chinese Academy of Social Science.

**MAO Rubai**

Mao Rubai is a member of the 10th National People's Congress (NPC) Standing Committee and Chairman of the NPC's Environmental Protection and Resources Conservation Committee. Mr. Mao has over 40 years of government service, previously serving as Vice Chairman of the Tibetan Autonomous Region's Government, Deputy Minister of the Ministry of Construction, and Chairman of the Hui Autonomous Region of Ningxia's People's Congress. Mr. Mao was also a member of the 15th Communist Party of China's Central Committee.

**PAN Yue**

Pan Yue is Vice Minister of the State Environmental Protection Administration, and in his first two years in that position has gained international recognition as a "courageous voice for a greener China." Before becoming a government official, he was a journalist, including three years as Vice Editor-in-Chief of China Youth Daily. Dr. Pan has also served as Vice Administrator of the State Administrative Bureau of State-Owned Assets, Vice Administrator of the State Bureau of Quality and Technical Supervision, and Vice Director of the Office for Economic Restructuring of the State Council.

**QIU Baoxing**

Qiu Baoxing is Vice Minister of the Ministry of Construction. He has a Ph.D. in Economics from Fudan University and a Ph.D. in City Planning and Design from Tongji University. Dr. Qiu is also a visiting professor at Zhengjiang University, Zhejiang University of Technology, and Fudan University, and a part-time professor at Nanjing University and Nanjing Finance and Economics University. He served as mayor of Hangzhou from March 1999 to October 2001.

**QU Geping**

Qu Geping has been a pioneer in environmental protection in China, working to integrate environmental protection policies into China's development strategies since 1972. He was Deputy Director of China's first environmental protection institution and the first Administrator of China's National Environmental Protection Agency. He also served as the first Deputy Director of China's State Environmental Protection Agency and chaired the Environmental Protection and Resources Conservation Committee under the National People's Congress. In recognition of his seminal environmental protection work in China, he has received prestigious international awards, including a Gold Medal from the United Nations Environment Programme in 1987 and the Blue Planet Prize in 1999.

**William K. REILLY**

William K. Reilly was the seventh U.S. Environmental Protection Agency (EPA) Administrator, serving from 1989 to 1993 under President George H.W. Bush and heading the U.S. delegation to the landmark United Nations Earth Summit in Rio de Janeiro in 1992. Mr. Reilly's work prior to his term as EPA Administrator was equally distinguished: he was President of both the World Wildlife Fund and The Conservation Foundation, Executive Director of the Rockefeller Task Force on Land Use and Urban Growth, a member of the President's Council on Environmental Quality under President Richard Nixon, and Chairman of the Natural Resources Council of America, an association of all major conservation groups. Mr. Reilly was also the Payne Visiting Professor at Stanford University in 1993-1994. Currently, Mr. Reilly is Founding Partner of Aqua International Partners, an investment fund in the water sector in developing countries, and Chairman of the World Wildlife Fund Board of Directors. He also serves on the board of directors of The David and Lucile Packard Foundation, the National Geographic Society, ConocoPhillips, DuPont, Ionics, and Royal Caribbean International.

**SONG Mi**

Song Mi is Vice Chairwoman of the State Electricity Regulatory Commission. She is a Senior Engineer and studied Hydropower Engineering at the Beijing Institute of Water Conservancy and Hydroelectric Power. From 2000 to 2002, Ms. Song served as Vice President of China Construction Bank; from 1985 to 2000, she held various positions within the State Planning and Development Commission, including Division Director of the Fuel and Power Engineering Department, Director General of the Investment Department, and Director General of the Infrastructure Department.

**Susan F. TIERNEY**

Susan F. Tierney has served as Assistant Secretary for Policy at the U.S. Department of Energy, Secretary for Environmental Affairs in Massachusetts, Commissioner of the Massachusetts Department of Public Utilities, Executive Director of the Massachusetts Energy Facilities Siting

Council, and Senior Vice President and Managing Principal of Lexecon, Inc. Dr. Tierney is now Managing Principal of Analysis Group in Boston, Massachusetts, where she consults on energy policy, regulation, and economics, particularly in relation to the electric and gas industries. Dr. Tierney is also Chairwoman of the Board of Directors of The Energy Foundation and Clean Air-Cool Planet; a director of Catalytica Energy Systems Inc., the Northeast States Clean Air Foundation, the Electric Power Research Institute, and the Climate Policy Center; and a member of the Harvard Electric Policy Group, the Massachusetts Renewable Energy Trust Advisory Council, and the Environmental Advisory Council of the New York Independent System Operator. She has published widely and frequently speaks at industry conferences.

**Colburn S. WILBUR**

Colburn S. Wilbur is a current Trustee and former Executive Director and President of the David and Lucile Packard Foundation. Mr. Wilbur is Chairman of the China Sustainable Energy Program's Senior Policy Advisory Council, a member of the advisory boards of The Sierra Club Foundation, the Entrepreneurs Foundation, and the American Land Conservancy, as well as an advisor to other philanthropic organizations in the United States, Great Britain and China. He served as Executive Director and CEO of the Sierra Club Foundation from 1960 to 1976. Mr. Wilbur has also served as a Senior Fellow of the Council on Foundations and was honored with their Distinguished Grantmaker Award in 1999.

**XU Kuangdi**

Xu Kuangdi is Vice Chairman of 10th National Committee of the China People's Political Consultative Congress (CPPCC) and President of the Chinese Academy of Engineering. From 1995 to 2001, he served as the Mayor of Shanghai, and he has also served as Executive Vice President of Shanghai Polytechnic University, Director of the Shanghai Municipal Higher Education Bureau, Director of the Shanghai Municipal Planning Committee, and Deputy Secretary of the Communist Party of China's (CPC) Shanghai Municipal Committee. Dr. Xu was an alternate member of the 14th CPC Central Committee and a member of both the 15th and 16th CPC Central Committees. He graduated from the Beijing Institute of Iron and Steel Engineering in 1959.

**YANG Jike**

Currently President of the South-North Institute for Sustainable Development, Yang Jike pioneered China's rural economic reform while Vice Governor of Anhui Province. Dr. Yang has also served as President of the China Energy Research Society, a member of the National People's Congress Standing Committee, and a member of the Standing Committee of the China People's Political Consultative Conference, the most senior advisory body to the National People's Congress and State Council.

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Zhang Guobao**,** currently Vice Chairman of the National Development and Reform Commission, is one of the foremost figures in China's infrastructure, industrial, and high-tech development planning. He was formerly Vice Chairman of the State Development Planning Commission, and has helped formulate China's 6th, 7th, 8th, 9th, and 10th Five-Year Plans. Mr. Zhang also served in several director-level positions within China's State Planning Commission prior to its reorganization into the State Development Planning Commission.

# Presenter Biographies

## CHEN Qingtai

Chen Qingtai is Vice Minister of the State Council's Development Research Center, a member of the China Monetary Policy Committee, Deputy of the National Congress of the Communist Party of China, and a member of the Standing Committee of the 10th China People's Political Consultative Conference (CPPCC). He has extensive macro-economic management experience in both the private and public sectors. In the private sector, he has served as Chief Engineer, President, and Chairman of China No. 2 Automobile Works, Chairman and General Manager of the United Company of Dongfeng Auto Industry, and Chairman of Shenlong Automobile Company. He is also currently Independent Non-Executive Director of Sinopec Corp. In the public sector, he has served as Deputy Director of the State Council's Economic and Trade Office, and Deputy Minister of the State Economic and Trade Commission. Mr. Chen is a graduate of Tsinghua University where he studied power and dynamics engineering.

## Steven CHU

Steven Chu is director of the Lawrence Berkeley National Laboratory, and a professor of Physics and Cellular and Molecular Biology at the University of California, Berkeley. Previously, he held positions at Stanford University and AT&T Bell Laboratories. Dr. Chu's research in atomic physics, quantum electronics, and polymer and biophysics include tests of fundamental theories in physics, the development of methods to laser cool and trap atoms, atom interferometry, and the manipulation and study of polymers and biological systems at the single molecule level.

While at Stanford, he helped start Bio-X, a multi-disciplinary initiative that brings together the physical and biological sciences with engineering and medicine. Dr. Chu has received numerous awards, including co-winner of the Nobel Prize in Physics (1997). He is a member of the National Academy of Sciences, the American Philosophical Society, the American Academy of Arts and Sciences, the Academia Sinica, and is a foreign member of the Chinese Academy of Sciences and the Korean Academy of Science and Engineering.

Dr. Chu also serves on the Boards of The William and Flora Hewlett Foundation, the University of Rochester, NVIDIA, and the (planned) Okinawa Institute of Science and Technology. He has served on numerous advisory committees, including the Executive Committee of the National Academy of Sciences Board on Physics and Astronomy, the National Institutes of Health Advisory Committee to the Director, and the National Nuclear Security Administration Advisory Committee to the Director. Dr. Chu received Bachelor of Science degrees in mathematics and physics from the University of Rochester, a Ph.D. in physics from the University of California, Berkeley, and a number of honorary degrees.

## Thomas JOHANSSON

Thomas Johansson was formerly Director of the Energy and Atmosphere Programme at the United Nations Development Programme and is currently Director of the International Institute for Industrial Environmental Economics at Lund University, Sweden. He is also International Co-Chairman of the Working Group on Energy Strategies and Technologies of the China Council on International Cooperation for Environment and Development, a founding member and current Chairman of the International Energy Initiative Board of Directors, Chairman of the United Nations Economic Commission for Europe's Energy Efficiency 2000 Project, a member

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**LE Jingpeng**

Le Jingpeng is Vice Director of and a Senior Economist at the Shanghai Economic Commission. He has extensive management experience in both the public and private sectors: he has served as Head of Shanghai's Baoshan district, General Manager of the Shanghai Fifth Steel Group Company, Head of Council for the Special Steel Enterprises Association of China, and Director of the Evaluating Department for the Shanghai International Industrial Fair. He has also represented China at an annual meeting of the World Economic Forum.

**Marie PENDER**

Head of the Climate Change Agreements and the U.K. Emissions Trading Scheme at the U.K. Department for the Environment, Food, and Rural Affairs (DEFRA), Marie Pender is responsible for the development, negotiation, and management of climate change and emission trading programs. She has worked in the Environmental Protection department at DEFRA since the 1970s, working primarily on climate change and waste management. She has extensive experience working with industry to redress environmental problems.

**William K. REILLY**

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of the Harvard Electric Policy Group, the Massachusetts Renewable Energy Trust Advisory Council, and the Environmental Advisory Council of the New York Independent System Operator. She has published widely and frequently speaks at industry conferences.

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**WU Guihui**

Deputy Director of the National Development and Reform Commission's Energy Bureau, Wu Guihui oversees oil, natural gas, oil reserves, renewable energy, and policy information at the Energy Bureau. He has worked in government administrative departments for most of his career, primarily in energy and macroeconomic policy administration. He graduated from Xi'an Jiaotong University in Power Generation.

**ZHAO Hang**

Zhao Hang is Director of the China Automotive Technology and Research Center (CATARC). He is also Vice Director of both the China Association of Automobile Manufacturers and the China Association of Automobile Engineers. Graduating from Jilin Industrial University's Automobile Department in 1982, Mr. Zhao has worked to develop China's auto industry for over 20 years. Mr. Zhao has published more than 20 papers, and has received many awards, including a special allowance for academic achievements from China's State Council in 1997.

**ZHOU Dadi**

Zhou Dadi is Director General of the Energy Research Institute and the Energy Conservation Information Dissemination Center of the National Development and Reform Commission. Since September 2005, Mr. Zhou has been a member of the Expert Team of the Energy Leading Committee of the State Council of China. Mr. Zhou is also a member of the Energy Expert Commission of the National 863 Plan for Science and Technology Development of China, participating in the development of the Medium and Long term Development Program of Science and Technology of China. He is chief investigator for a series of energy policy studies, including "the Petroleum Development Strategy of China", "the Energy Scenario for 2020 of China", and "the Medium and Long Term Energy Development Strategy of China"; chief coordinator of the China/GEF/UNDP End Use Energy Efficiency Program of China; Executive Director of the Beijing Energy Efficiency Center (BECon); and was Deputy Director of the Program Office of the China Green Lights Program.

Mr. Zhou is chief scientist of the Expert Team of the China Working Group III for Climate Change; chief scientist in charge of the emission inventory for preparation of the First National Communication Report of China to UNFCCC; and a member of the phase two Science and

Technology Advisory Panel (STAP) of the Global Environment Facility (GEF) during 1998-2002. He is the leader author of the Second and Third Scientific Assessment Report of the IPCC, and CLA of the Forth Report of IPCC, and was awarded the 2000 CTI Award for his contribution to energy efficiency and climate change abatement.

Mr. Zhou is Vice Chairman of the Board of Executive Directors of the Chinese Society of China; Chairman of the Energy Economics Committee; and Chairman of the Board of the Beijing Energy Association. He is senior advisor of CNOOC and the Shanxi Provincial government, and the Advisor to the Ministry of Construction on building energy efficiency.

**ZHAO Jiarong**

Zhao Jiarong is Director General of the National Development and Reform Commission's Department of the Environment and Resource Comprehensive Utilization. She has previously served as Division Director of the National Bureau of the Statistic's Department of Industrial and Transport Statistics, as well as Division Director, Department Deputy Director, and Director General of the defunct State Economic and Trade Commission (SETC). In 1978, Ms. Zhao received her Bachelor of Science degree in Economics from Liaoning University.

# A Study of Financial, Taxation, and Economic Policies for Sustainable Energy Development

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## I. Assessment of China's energy supply and demand over the next 2 decades

First, China's economic and social development will be severely constrained by energy resources in the foreseeable future. How to sustain rapid economic growth under such energy resources constraint has become one of the most formidable challenges facing China. Without effective policies, it will be very difficult to stem recent years' unfavorable increase in energy intensity. Moreover, the energy situation in China makes it unlikely that China will realize its goal of quadrupling GDP by 2020 while only doubling energy consumption, and it is difficult to remove the constraint of energy any time soon.

Second, it will be more difficult to further boost energy utilization efficiency and reduce energy intensity in the first 20 years of this century than it was in the prior 2 decades. High energy consumption is primarily due to recent years' accelerated development of heavy industry, a situation unlikely to change any time soon. Solving energy issues will include actions taken not only in the energy sector; a large focus must be changing China's mode of economic growth, i.e., increasing energy utilization efficiency on the demand side (enterprise and residential energy consumption).

Third, the experiences of industrialized countries indicate that China may be prone to "path dependence"—having its economic growth locked into a path of high energy consumption—if it fails to seize opportunities to enhance the sustainability of its economic growth in the period of accelerated industrialization, rapid urbanization, and rising standards of living.

Fourth, numerous recent problems are a direct result of a lack of energy policies and buildup of chronic contradictions among policies. We must patch gaping policy loopholes; rapidly establish effective energy-related financial and taxation, energy pricing, and energy investment policies; restructure energy regulation; and update laws and standards. Only by taking these actions can we move towards the goal of building an energy-saving society and 5th Plenary Session of the CPC Congress's target of cutting unit GDP energy consumption by 20% over the next five years.

## II. Reforming and refining energy price formation mechanism and pricing policy

In general, the price formation mechanism has 3 "non-reflects": it does not reflect (1) the degree of energy scarcity, (2) the supply and demand relationship of energy products, (3) the external costs of energy production and consumption (i.e., environmental and ecological damage).

Energy price reform should do the following: (1) establish a price formation mechanism dictated as much as possible by market supply and demand, allowing price to optimize resource allocation; (2) reconstruct the energy price control system based to fit the market economy; (3) strengthen "external" control to internalize the "external costs" and "external benefits" associated with resources and environment, promoting energy structural optimization and adjustment. In generally speaking, we should take energy conservation as the central goal of energy pricing policy, and also promote new energy development.

*Coal pricing*

Energy price reform should reform coal pricing as follows: set coal and electricity prices based on the market rules; refine the "coal/electricity linkage" mechanism; allow coal resources to enter the market; and establish a scientific system of resources taxes and charges.

*Oil pricing*

Oil pricing should be reformed to reflect actual supply and demand in the domestic market; the current mechanism should be gradually shifted to a market-based pricing system. We propose to reform the current price system by (1) linking the price of domestic oil to crude oil prices rather than oil product prices in the international market; (2) significantly reducing price adjustment lags to increase the risk of speculation; (3) shift the role of government from reviewing and approving prices to formulating pricing methods and rules and supervising their implementation.

*Natural gas pricing*

The long-term goal of natural gas pricing reform is to allow the market determine wellhead and end-user gas prices based on the separation of "production, transportation, and sale." Pipeline transport fees may still be subject to government control. At present, the priority is to keep natural gas prices at a reasonable level and set a reasonable price relationship between natural gas to other energy products so as to promote the rapid development of natural gas use.

*Electricity pricing*

Electricity pricing reform should focus on accelerating the reform of electricity tariff-setting mechanisms according to the electricity system reform scheme and electricity price reform arrangement. The "ex-plant" price and retail price should be subject to market supply and demand, while power transmission fees will still be under government control. In general, retail prices should match changes in electricity cost and demand and internalize social and environmental costs.

**III. Accelerating energy investment and financing system reform**

The energy investment regulatory system has the following problems (to a more acute degree than other competitive industries): (1) there is more governmental intervention needed in the energy sector than in other competitive industries; (2) investors lack decision-making power; (3) review and approval procedures are opaque and arbitrary; (4) short-term supply and demand balances are given too much attention while energy conservation and the environmental impact of investment projects is neglected; (5) there is a monolithic ownership structure and substandard investment/operating efficiency; and (6) there is a lack of attention to energy conservation and "new energy" projects.

Reform of the energy investment and financing systems should have the following two objectives: (1) diversify the currently-state-ownership-dominated ownership structure in industry and significantly boost return on investment (ROI) and operating profitability; and (2) establish effective investment incentive mechanisms and promote the development and use of energy conservation and new energy technologies.

We recommend adopting the following measures in the near future. First, regulate by category and expand corporate investment decision-making power. Government investment projects and

corporate investment projects should be regulated separately. Governmental approval of corporate investment projects should be streamlined, with more decision-making power delegated to enterprises.

Second, establish an access mechanism based on energy conservation, resource utilization, and environmental protection. The energy project access system should focus primarily on developing of natural resources in a reasonable way, protecting the ecological environment, optimizing industrial structure, safeguarding public interests, preventing monopolies, and ensuring economic security.

Third, break up state monopolies in the energy industry, encourage private and foreign capital involvement, introduce project bidding systems, let state-owned enterprises and private companies to compete on a fair, equitable and open basis, and allow them to win project investment and operating licenses through competition.

Fourth, boost governmental investment in new energy and energy conservation. Government investment should focus on areas in which general investors do not wish to invest or in which the market mechanism fails to work properly. At the same time, the government should support pilot projects.

**IV. Establishing and refining financial and taxation policies**

Existing financial and taxation policies are devoid of system design, coordination, incentives, and penalty measures for sustainable energy development. In a market economy, financial policies should be the principal means by which the government regulates energy. At the same time, the government should adopt effective economic incentive and penalty policies to help optimize and guide energy consumption, promote energy conservation, optimize energy structure, and stimulate renewable energy development.

Considering the basic treasury restructuring approach, we can divide energy financial and taxation policies into the 3 categories: *positive incentive policies*, *negative restriction policies*, and *"cross-subsidizing" policies*.

*Positive incentive policies* include (1) budget policies increasing investment (including the proportion and purpose of investment); (2) government bond investment policies; (3) interest rate discount policies; (4) preferential taxation policies; (5) tax-based disbursement systems; and (6) government purchase policies. While holding the total volume under control, we can support individual pilot projects with government funds on a case-by-case basis or bundle existing government-funded projects with top-quality energy projects after reorganization and renovation.

*Negative restriction policies* include (1) establishing a flexible system of levying fixed assets investment regulation taxes; (2) expanding the scope of excise or consumption taxes; (3) levying fuel taxes; and (4) conducting research on the feasibility of imposing carbon taxes.

*"Cross-subsidizing" policies* are intended to raise money from conventional fossil-fuel-based energy (primarily raw coal, crude oil and natural gas) through a specific method, and earmark such proceeds for energy conservation and renewable energy development.

We propose 5 specific "cross-subsidizing" policies. First, completely reform the resources tax system, levying a resources tax based on the recoverable reserves allocated to enterprises, rather than on their output. Link tax rates to resources recovery rate and environmental reclamation and determine tax rates based on specific indices of recovery rate and environmental reclamation.

Second, further support renewable energy development. In specific, we should (1) adjust and refine the renewable energy VAT policy, uniformly reducing VAT rates for water and electricity suppliers (public utilities); (2) adjust and fine-tune renewable energy enterprise income tax policy, uniformly reducing income tax rates for renewable energy products to 15% in the prospective income tax convergence reform in China; and (3) implement an investment tax refund system adopting the accelerated depreciation method.

The third set of policies relate to energy conservation: (1) support energy conservation with government appropriations, setting up an escrow account for energy conservation and making budgetary arrangements for energy conservation; (2) adjust the budgetary expenditure structure, increasing investment in the energy conservation technology research development, energy conservation technology demonstration and promotion, energy conservation education and training, and energy conservation regulatory system construction; and (3) encourage energy conservation through government purchasing policies.

Fourth, encourage energy conservation through taxation policies. With reference to the taxation policies for high-tech enterprises and comprehensive resource utilization enterprises, offer certain income tax breaks to energy conservation product manufacturers; temporarily reduce or eliminate VAT on major equipment and products that are superior in energy conservation but not price competitive; and levy fuel taxes as soon as possible to encourage rational energy consumption.

Fifth, increase government budgetary investment in energy research and development. In specific, boost governmental investment in research and development; adopt an interest rate discount policy; and use a moderate amount of government money to attract more private investment in energy research and development.

**V. Reforming government administrative and regulatory systems**

China's existing energy administrative and regulatory systems are unfit for sustainable energy development, because of their weak coordinating capability, inadequate policy enforcement ability, insufficient social supervision, inconsistent central and local policies, substandard regulation entangled with loopholes, inadequate administrative and regulatory effort, and severe personnel shortages.

To refine China's energy regulatory system, boost its comprehensive coordination capacity, effectively implement energy strategies and policies, and transform governmental functionality, we recommend the following 4 changes.

First, restructure energy regulatory organizations according to the principle "separating macro-regulation from micro-enforcement." China should establish a comprehensive energy administrative organization (i.e., Ministry of Energy) and a specialized energy supervisory organization (Energy Supervisory Commission) with distinct responsibilities.

The Ministry of Energy should be dedicated to formulating national energy strategies, energy plans, and policies, and coordinating the actions of all energy departments. The Energy Supervisory Committee, on the other hand, should be solely responsible for market supervision and inspection in order to ensure healthy development and orderly competition in the energy industry. To streamline the relationship between central and local governments, China should establish regional comprehensive energy administrative organizations and regional specialized energy supervisory organizations (e.g., East China Energy Bureau and Supervisory Office) in the major economic regions (e.g., North, Northeast, and Southwest China). Such regional agencies should be the local offices of the central government's Ministry of Energy and Energy Supervisory Commission.

Second, government regulation should shift from the supply side to demand side, avoid focusing on supply side control--resources development and energy production--, and gradually move toward demand side control--energy development, energy conservation, and energy technology development.

Third, strengthen ongoing supervision and make the access system scientific and transparent. The priority in reviewing and approving projects is to formulate reasonable access standards for resources, environmental protection, and energy efficiency (including market access for project investment and high-energy- consumption products), and emphasize policy guidance, openness, and transparency. In the ongoing administrative phase, the top priority is to refine the energy audit system through supervision, regulation, and inspection; fine-tune organizational setup and staffing arrangements; and change the current situation of "focusing on market access, but neglecting ongoing supervision." After this phase is completed, the regulatory priority should be to investigate and punish perpetrators, with losses compensated.

Fourth, shift the regulatory focus and refine the regulatory system. In specific, (1) shift the old regulatory approach dominated by economic regulation complemented with social supervision into a new regulatory system dominated by social supervision complemented with economic regulation, refining market access control; (2) make the access system open and transparent, eliminating discriminatory treatment of different ownerships, ensuring policy transparency, establishing a reasonable complaint system, and improving price regulation; (3) reform the price formation mechanism, imposing limited control on natural monopoly sectors, integrating protective control measures with incentives, refining the financial, cost, information disclosure, and price hearing systems, and strengthening social oversight.

The regulatory priority should be (1) boosting resource utilization efficiency, ensuring energy supply security, and protecting the environment, and (2) strengthening market inspection with a focus on anti-monopoly cases, promoting efficient competition, and investigating and reviewing major mergers and acquisitions that will have a significant impact on market structure. Additionally, we should refine the existing electricity regulatory system, give the China National Electricity Supervisory Commission price control powers, and regulate the natural gas industry (especially pipelines) at the appropriate time.

# Reforming China's Energy Management System and Establishing a Modern Regulatory System

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Sustainable development of energy in China can be achieved through reforms in the government energy management system, as well as through the establishment of a modern regulatory system. China needs to draw on the successful experiences of foreign countries and apply them to the actual current domestic conditions. Establishing a modern management mechanism and system is also part of our goal of improving the efficiency and regulation of governmental energy management and achieving sustainable energy development through continuous innovation. In recent years, energy shortages and rapidly increasing energy consumption have hindered the sustainable development of natural resources, damaged the environment, and undermined public health in China. To better adhere to the central government's social development strategy, which emphasizes resource efficiency and scientific development, the government needs to reform its institutional system, create efficient and capable government agencies, and improve the current energy management and supervision system. Otherwise, the government is in danger of failing to reach its above-mentioned strategic goals for social development.

## I. Major Problems in China's Energy Administrative Mechanism and Regulatory System

In general, the existing energy management mechanism and energy regulatory system in China fails to meet the requirements of sustainable energy development. There are six reasons for this:

1. Lack of coordination capability. The "3 discrepancies" problem, i.e. discrepancy between objectives and pace, discrepancy between national interest and local interest, and discrepancy between short-term benefits and long-term benefits, are common throughout all levels of governments and functional departments responsible for finance, taxation, investment, pricing, economy, urban construction, communications, state assets management, etc.

2. The implementation of policies is unsatisfactory. The government management system is putting more emphasis on the examination and approval of policies, rather than their regulation and management.

3. Inadequate social regulation. Existing government energy management focuses more on the economic side, such as investment, pricing, production scale, etc., than on the regulation of external issues such as environment, security, quality, and resource conservation. This imbalance has resulted in more emphasis on production than on consumption, and more emphasis on supply than on conservation.

4. Discrepancies between central and local government policies. Energy plays an important role in economic growth, finance, employment, and distribution of income, as well as the social stability of the country. The long-term objectives of the central government conflict with the short-term objectives of local government. This conflict in objectives creates disagreements between the central government and local governments regarding the target, actions, and level of energy management. A typical example is the difference in opinions regarding the regulation of economical automobiles.

5. Regulation is inadequate. In foreign countries, one can see that centralization of the regulatory power facilitates enforcement of regulatory policies. However, the power to regulate the energy sector in China is decentralized and regulatory organizations lack clear functions. In some cases, even the most fundamental regulatory power is lacking. For example, the National Electricity Regulatory Commission lacks essential regulatory powers regarding pricing and accession of administration.

6. Severe understaffing of energy management agencies. The population of China is 1.3 billion and there are 12 million workers in the energy sector, with over 5 million in the coal industry alone. However, only a few dozen people now work in the energy management department in the Chinese central government, in comparison to 150,000 federal employees engaged in full-time energy management in the U.S. Department of Energy.

## II. Objectives & Focus of Reform

**To solve the previously stated six problems, China needs to reform its energy management system and allow market forces to act freely.**

### General Objectives of Reform:

1. Establish a modern regulatory system by absorbing successful international methods. This system should be independently operated, administration and regulation should be separated, and adequate authority should be ensured. Checks and balances of power should be effective.

2. Ensure independence of the regulatory body. Whether the regulatory authority is under direct government administration or not, keeping the regulatory authority independent is the foundation of building the modern regulatory system.

3. Separate the administrative body from the regulatory body. Administration should be separated form regulation and the formulation of a policy should be separated from its implementation. This is essential to ensure the independence of the regulatory body and consistency of regulatory policies.

4. Improve regulatory function. In conjunction with loosening economic regulations (e.g. regulations on investment, pricing, market access, etc.), we should strengthen social regulations, especially those on monopolized sectors. The focus of the regulation should be shifted accordingly to changing needs.

5. Strengthen regulations through the law. We should improve the connection between law and regulation in the energy field. Strengthen regulatory law, carry out regulations effectively, and establish an effective checks-and-balances system.

Under the guidance of these general objectives, China's reform of its energy administration mechanism and regulatory system can be carried out step-by-step. The different requirements of short, mid, and long-term targets will work as a reference to specify the reform focus and steps to be taken.

**Short-Term Target (1-2 years):** The focus in this period shall be improving regulatory function, shifting management focus, strengthening coordination capability of energy management departments, and improving the regulatory function of the regulatory body (e.g. regulatory function of State Electricity Commission on electricity pricing). The focus of the regulation will shift from energy production and supply, to demand, while economic regulation will shift to social regulation.

**Mid-Term Target (2-5 years):** The focus in this period will be restructuring the government bodies by clarifying the responsibilities of central and local governments. The energy administrative bodies shall be reformed with a focus on strengthening the administrative ability of the government. The targets of the central and local governments regarding organization and system security will be integrated.

**Long-Term Target (5-10 years):** The new management system and long-term mechanism for sustainable development will be developed according to current laws. While carrying out energy management regulations, the focus will be on saving energy, improving energy efficiency, ensuring energy safety, and developing renewable resources.

## III. Initial Concepts in China's New Energy Administrative System

The "separation of administration from regulation" shall be adopted to restructure the energy administrative bodies when establishing the new energy administration system in China. The "separation of administration from regulation" will be realized by establishing a "two-tier structure" in energy management: comprehensive energy management bodies (e.g. Ministry of Energy) will be separated from specialized energy regulatory agencies. The division of labor will be clear since the power and responsibility shall be well defined. The comprehensive energy management bodies will mainly be responsible for the formulation of national energy strategies, proposals and policies, and coordination between energy departments. The specialized energy regulatory agencies will be responsible for market regulation, so as to ensure the healthy development of, and orderly competition in the energy industry.

Based on China's geographic economic zones (e.g. northeast, north, southwest), it is feasible to establish specialized regional energy administrative and regulatory departments (e.g. East China Energy Bureau and East China Regulatory Agency). These departments shall work as representative agencies of the central comprehensive energy administrations and specialized regulatory departments. The provinces, autonomous regions, and municipalities could also establish their own comprehensive energy administrations and specialized regulatory

departments, working as representatives of the corresponding departments in their economic zones. This practice will enhance integrity and congruity in energy administration, effectively carrying out specialized regulation and enforcing the national policies.

Features of the new energy administration system:

1. Shifting the administrative functions. The focus of the administration will be shifted from supply side to demand side. Conventional supply-side management focuses on exploitation, processing, and production of energy resources, while demand-side management focuses on energy resource development, conservation, efficiency, technology, etc.

   (a) **Examination and approval periods:** The focus of management will be on market access and accession of standards in terms of the environment, efficiency, etc. More emphasis will be placed on the direction, openness, and transparency of policies.

   (b) **Mid-project periods:** Managerial focus will be on regulation, administration, and examination. In addition, the energy efficiency auditing system, organizational structure, and manpower security should be improved.

   (c) **Post-project period:** The focus of the management will be shifted to the punishment of regulation violators and loss compensation.
2. Transforming the regulation mode. The conventional regulation mode, in which social regulation takes a back seat to economic regulation, will be transformed into a new one focusing more on economic regulation.

The new regulatory mode includes:

(a) Improve market access regulation by publicizing market access regulations, abolishing discriminatory opinions on ownership, ensuring the transparency of policies, and formulating a proper complaint system.

(b) Improve pricing regulation by reforming the pricing mechanism and regulating naturally monopolized sectors effectively. It is also necessary to integrate protective regulation with incentive regulation and improve the financial, cost, price hearing, and information notification systems.

(c) Strengthen social regulations by focusing on improving resource utilization efficiency, safeguarding the energy supply, and protecting the environment.

(d) Reinforce market order regulations by focusing on countering monopolies, encouraging efficient competition, and examining merger and acquisition cases that would influence market structure.

# Investment and Financing Policies to Promote Sustainable Energy Development

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Since 2000, China has invested much in its energy industry. Investment in energy-related infrastructure has increased 23.4 times between 1979 and 2000 with an annual rate of increase of as much as 15.6 percent. During this same period, the investment and financing of energy saving increased eighteen-fold, with an annual rate of increase of 15.9 percent. These investments contributed much to China's economic development between 1980 and 2000, when the ratio of economic development to increase in energy consumption was 2 to 1.

In recent years, investment in fixed capital in the energy industry has been decreasing yearly, with investment in energy saving decreasing especially rapidly. This investment decrease has been one of the reasons behind recent energy supply shortages. Based on the estimates of investment in the energy industry between 2004 and 2020, the total amount of investment will be RMB 18 trillion, and 40 percent of that, or RMB 7.2 trillion, will be for clean energy, nuclear energy, energy saving, and environmentally friendly infrastructure. Therefore, the annual input will be RMB 400 billion. This funding comes from the government and the social financing system. The Chinese government should make policies to develop the financing system for clean energy.

## 1. Encourage private capital to invest in energy construction

The government should continue relaxing the restrictions on private capital and social capital investment in energy construction, and break the excessive monopoly over the energy industry by state-owned enterprises and the stated-owned economy. Traditional energy and new energy development projects, developed and utilized by the state's monopoly resources, need a whole allocation. Therefore, the government should adopt public bidding approaches, naming the investor, sponsor and operator of the projects. It should reduce the percentage of various types of capital investment in energy conservation and in new energy source construction projects. Additionally, it should encourage social capital and private enterprises to cooperate with state-owned enterprises and to undertake investment construction and operation of traditional energy and new energy source projects; this cooperation can take many forms: joint venture, cooperation, pooling operation, and project financing. The state should provide financing support, including favorable taxation, investment guarantee and issuing enterprise bonds. The government should also support the investment activities of private enterprises and of social capital in new-source energy and energy conservation projects by offering investment subsidies and loan interest, or even by inputting a percentage of the capital.

## 2. Establish a market-access mechanism for energy conservation and environmental protection

The state should set high standards for energy consumption restrictions for equipment, transportation tools, and buildings used in construction projects. It should also work out laws to

have certain construction materials carefully checked. Projects not up to energy conservation standards will not be allowed to undertake construction and operation.

**3. The government should adequately emphasize the development of new energy and energy conservation technology**

Technology restrictions and high costs contribute to the difficulty of achieving this objective**.** It is the government that plays the major role in state investment and investment in industrial experiments for new energy and energy conservation technology should be increased. The government may adopt incentive policies to attract various investors to participate in the relevant development and promotion work.

**4. Industrial energy conservation**

Energy consumed in the industry accounts for about 70 percent of China's total energy consumption, a large amount of which is consumed in the high-polluting industries of steel, non-ferrous metal, construction material, coal, electrical power, oil and chemistry. To carry out industrial energy conservation, these industries should be put at the top of the agenda and the investment process should be controlled, and gradually expanded to other industries.

First, it should formulate the design standard for industrial equipment, and require enterprises that provide production equipment to stop producing high-energy and seriously polluting equipment. The state should provide funding support for those enterprises for whom changing production requires unbearably large amounts of investment .

Second, the design of new production lines must adopt advanced domestic energy conservation equipment and environmental protection facilities. Those not up to the design standard regulated by the state will not be allowed to undertake construction.

Third, the government should increase technical reform of current enterprises to save energy and prevent pollution, and those enterprises characterized by high-energy consumption and pollution should be reformed within a time limit. Those enterprises delaying reform will be ordered to stop operation, while the state should provide certain help in the aspects of assets and technology to those enterprises which lack technical reform capacity.

Fourth, the government should restrict the scale of construction, and prohibit the construction of small steel, cement or chemical fertilizer enterprises the energy consumption of which is higher than the average.

**5. Policy banks should focus on supporting sustainable energy project construction projects**

Unlike regular energy projects, sustainable energy and energy conservation projects gain low inner fiscal benefits, but have high external benefits to society and the environment. This is recognized by policy-based financial agencies. The China Development Bank gives priority in offering credit support to these public projects and then gradually withdraws from the field already crowded with relatively mature technologies and sufficient market Thermal Power

Station Projects. The Agricultural Development Bank should regard energy construction in the agricultural and pastoral areas as one of the focuses of its soft loans.

**6. The state establishes new energy development funds and guarantee funds**

To solve the problem of fund shortage for new energy development projects, it is suggested that the state and local authorities adopt the measure of increasing electricity tariffs in order to accumulate funds that will be specially used to support new energy construction. For new energy construction projects urgently in need of loans from financial agencies, the state and local governments may establish loan funds on new energy project.

**7. The state should give certain financial support for energy environmental protection facilities of construction projects**

In order to encourage and guide enterprises to construct and operate corresponding environmental protection facilities/projects, the state should provide investment subsidies of a certain percentage for energy environmental protection projects. In order to reduce burden of debt for energy environmental protection projects, the government should offer certain loan discounts for energy environmental protection projects and strengthen development of and technical investment in energy environmental protection facilities so as to reduce the burden of such investment resting on the enterprise.

**We can work on the following two projects:**

**I. Developing an effective information system for energy efficiency and sustainable energy investment and financing**

According to international experience, information programs are more effective when combined with other initiatives such as financing incentives and energy standards. Government departments should regularly publicize detailed information on relevant state's policies, regulations, planning, and incentive programs, etc. to help investors to know clearly the government policies for and investment climate of sustainable energy development. This will help industries develop confidence in sustainable energy investment and reduce the chance of market failures or risks due to the lack of information.

There are two major categories of information valuable to investors: 1) the information concerning future energy supply and changes in the market, including information on socio-economic development at the macro level, information about gross demand and supply, changes in government policies, industrial development and adjustment, supply and demand of a particular industry or of a particular region, development trends of international markets, as well as the changes in price for relevant products; and, 2) the information about product technology, including information on new technologies and new products development, the application of new technologies and their market potential, the application of the same technologies in international markets, the attitudes of domestic counterparts on the new technologies, and the products renovation cycle.

In order to provide comprehensive and accurate information for investors to engage actively in energy investment, it is suggested that the construction of the state's sustainable energy

investment information system be initiated during the "11th Five Year Plan" period, and that a system for effective information dissemination be established.

**1. Establish a national-level investment information system**

a. The Role of the Investment Information System:
It will provide information for state governments' decision-making process concerning either macro control or sustainable energy development policies. It will also be used by private sector decision-makers and by researchers interested in sustainable energy investment.

b. The main content of the Information System will be:
1) Database of Government Policies, including various policies, laws and regulations publicized by various government departments concerning sustainable energy development and investment; 2) Database of Energy Investment Statistics which contains detailed information about various energy construction projects, including those finished, those being constructed and those under planning; 3) information about sustainable energy technology development and application both inside and outside China; and 4) books and essays containing valuable ideas or concepts about China's sustainable energy investment issues.

The databases should be renewed regularly. Therefore, a strict and smooth sustainable energy information report system should be established. The information collected and acquired by statistical department and investment administration department during project approval or registration process should be utilized fully and incorporated into the databases on a timely basis.

**2. Strengthen the information directive works**

**First, the relevant departments of the state and regional government should regularly publicize information on the development and application of sustainable energy technology within their scope of management.**

Second, the government should establish a training system in which the government or relevant institutions entrusted by the government should regularly organize training courses for the leaders of enterprises to convey information on sustainable energy development. Meanwhile, social bodies and intermediary organizations should also be encouraged to provide free information training and consulting services on sustainable energy for the leaders of enterprises, and government should give proper financial support when necessary.

**II. Address the use of flammable gases and reduce related accidents and pollution**
China is a country with a huge coal reserve and output, abundant in coal-bed gas deposits. It is estimated that China's total coal bed gas deposits within the seam of 2000 meters reaches 30 to 50 trillion cubic meters, making it the third largest in the world.

Development and use of coal bed gas is a new topic in China, the primary stage of which requires quantities of investment in R&D research, exploration and development, as well as experiments in commercialization. The state's support for the industry's formation and development is of high importance. Therefore, the state should include this task in its energy development planning and provide policy and financial support. It would be advisable for the government to support several experimental zones for commercialized development at first, allowing them to then spread more widely when proven to be successful. The state should also formulate access standards and preferential policies regarding investment and financing subsidies, taxation, pricing and access to the power grid, in order to attract investment for the development of coal bed gas.

Each year there are large amounts of gas emissions produced from coke furnaces and blast furnaces: 20 billion cubic meters and 8 billion cubic meters, respectively. These emissions, discharged into the air, cause severe pollution and result in a great waste of resources. Although China has developed "clean" technologies for using coke and blast furnace gas, they are seldom used in practice, as enterprises lack incentive to investment in expensive, coordinated facilities. **A possible solution is to** promote cyclical economic and environmental protection policies which require new enterprises to establish coordinated production lines, utilize inflammable gas emission from the process line to generate power, manufacture coal-related chemical products, or provide power for residents' daily use. The government should provide fund subsides for enterprises with limited funds or invest directly in the facility construction targeted at customers/users and encourage more investors to invest in downstream enterprises by establishing a union with them, or by setting up client relations. It has been proven that enterprises using gas from coke furnaces and blast furnaces have great profit-making potential, becoming very attractive industries for investment.

# Fiscal Policy Recommendations for Sustainable Energy Development

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In present-day China there are still no sound fiscal policies supporting energy development. The existing ineffective and fragmented fiscal policies fail in their role to help China fulfill the requirements set by the National Strategy of Energy Development. Our recommendation for the next step is to establish an effective fiscal policy framework that fosters sustainable energy development. This framework would have three facets: 1) implementation of positive incentives (including, but not limited to: increasing budgetary investments; national debt investment policies; financial discount loans and other subsidies; taxation incentives; and government procurement policies); 2) implementation of negative restrictions (including, but not limited to: extending the scope of excise duties; speeding up the levying of the fuel tax; establishing an energy tax; and reforming the compensation-fee charges on mineral resources); and 3) adoption of a "cross-subsidy" policy (i.e. mobilize a percentage of funds originally destined for the consumption and utilization of traditional fossil energy resources to support energy efficient projects for the development of renewable and new energy sources). Our primary policy recommendations are enumerated below.

## I. Fiscal policies to improve energy efficiency

### 1. Recommendations for government budgetary investments

(1) Allocate in the current account a budget expenditure item for energy saving and arrange corresponding budgetary funds. These funds should be used primarily for R&D in the field of energy-efficient science and technology, to demonstrate and popularize energy-efficient technologies, to educate on and offer training relevant to energy efficiency, and to construct an energy-saving management and monitoring system.

(2) Consolidate budgetary and national-debt investments, and increase investments in energy – saving activities.

(3) Establish a special fund for energy economization.

### 2. Corporate income tax incentives

(1) Establish corporate income tax incentives to encourage the production of energy-saving products.

Halving the corporate income tax rate is recommended as a direct incentive for enterprises to produce energy-saving products. Enterprises not fully engaged in the production of energy-saving products should still be able to enjoy the halved tax rate, but only on the revenues derived from the production and sale of energy-saving products. The prerequisite for such enterprises are that they separate their revenue accounts for energy-saving products and non energy-saving products.

(2) Establish corporate income tax incentives to promote the use and consumption of energy-efficient products.

It is recommended that for equipment purchased by enterprises to reach the energy-consumption standards set by the state, a certain percentage (e.g. 15%) of the purchase amount be deducted from the taxable amount. If the taxable amount of the current year is not sufficient for the deduction, the taxable amount for the following years (a maximum of 4 successive years) can be accumulated for the deduction. For energy-saving equipment that becomes a fixed asset for an enterprise, a shortened depreciation period or an accelerated depreciation should be allowed.

(3) A catalogue of existing corporate income tax incentives promoting energy efficiency should be compiled.

### 3. Government procurement policies

(1) Strengthen authentication of energy-efficient products.
(2) Following a centralized model, accelerate government procurement of energy-efficient products.
(3) Attempt to use a contract supply system for energy efficient-products.
(4) Strengthen publicity of government efforts in the procurement of energy-efficient products.

## II. Fiscal policies to support the development of clean and renewable energy resources

### 1. Fiscal policy recommendations to promote the development of renewable energy resources

(1) Adjust and improve VAT on renewable energy resources.

In order to develop wind power generation, VAT treatment on wind power plants should be lowered to at least equivalent to, or lower than, the VAT applied to coal electricity plants. Reforms on VAT incentives for hydropower plants should be two-fold: 1) The VAT rate for all hydropower plants should be commonly lowered to at least equivalent to coal electricity plants; 2) The VAT rate for micro-hydropower plants should be maintained at about 3%.

(2) Adjust and improve corporate income tax measures for firms engaged in producing and marketing renewable energy resources.

Consolidation of corporate income taxes, and the development of policy regarding renewable energy resources, should be done at the national level: 1) A 15% corporate income tax rate should be used for all firms manufacturing or selling renewable energy products; 2) A percentage of investments made by renewable energy firms should be deducted from income taxes; 3) An accelerated depreciation method should be used and expenses on R&D should be increased.

(3) Adjust and improve import tariffs on equipment used to produce renewable energy resources.

Domestic firms should enjoy the same tariff and import VAT exemptions treatment as foreign-funded firms in order to encourage domestic investments in renewable energy and the purchase of renewable energy equipment. These reforms would ensure that domestic and foreign firms are treated equally, promoting renewable energy development.

(4) Clarify the objective of financial support for the development of renewable energy resources.

The following actions are suggested:

1) Increase policy support of R&D in renewable energy resources.
2) Improve the state subsidization of renewable energy resources.
3) Focus on renewable energy development in rural areas.

**2. Fiscal policy recommendations to accelerate nuclear power development in China**

(1) Establish earmarked funds to support nuclear power generation and ensure sufficient investment in relevant R&D for advanced technologies and plans to automate plants. The government should provide appropriate amounts of subsidies for technological innovations and should share with the nuclear power plant owners the construction risks and start-up expenses of plant-automating projects.

(2) Relevant materials (i.e. components or equipment that cannot be produced domestically and must be imported) should be exempt from import taxes.

(3) To minimize cost and maximize nuclear power's marketability as a form of energy, the VAT on nuclear power plants should be lowered to the rate of the VAT on micro water power plants (6%) by 2010.

**3. Fiscal policy recommendations to accelerate clean-coal technology development in China**

(1) Support: 1) R&D in fundamental clean-coal technologies; and, 2) Pilot large investment projects using clean-coal technology (such as coal gas and liquid coal), which are environmentally-friendly but risky.

(2) Fiscal incentives should include import tariffs, import VATs and financing support, as well as low-interest-rate loans or subsidies.

(3) Support the coal preparation industry in promoting technology innovation and subsume clean-coal technology into a national project. Among other forms of assistance, this project would receive special loans for saving energy and support for technology innovation.

(4) Encourage the implementation of a "discriminatory" fee applied to $SO_2$ emissions. Lower fees should be applied to low-$SO_2$-emitting firms utilizing advanced technologies; higher fees should be charged to firms that cause environmental damage yet are still within emissions standards; and punitive fees should be applied to firms causing serious environmental damage and whose emissions exceed emissions standards limits.

## III. Fiscal policies to promote structural adjustment of the energy industry and to ensure energy supply

### 1. Establish a national strategic oil reserve system

In financing the national oil reserve, both foreign experiences and the domestic situation should be taken into account. Foreign experiences would suggest the following methods:

(1) Establish a special fund financed, for example, through price increases on finished oil products, or by diverting a percentage of tax revenues from a specific source (e.g. oil excise duty).

(2) Levy a special tax.

(3) Issue earmarked government bonds.

### 2. Encourage state-owned energy enterprises to develop an energy cooperative market overseas

The government should adopt several new measures to support the cooperation of state-owned energy enterprises in overseas markets. For example, the government should coordinate the overseas business of China's three largest oil enterprises, especially facilitating approval processes. Additionally, the government should provide state-owned energy enterprises with fiscal support for improving their financial management, investment risk funds, and tax deduction incentives.

### 3. Support the development of traditional energy industries (e.g. the coal industry)

The coal resource tax should be adjusted. Taxation policies and corporate financial regulations should be put in to place to enhance safety in the coal production process.

## IV. Fiscal policies to support energy-related R&D and technological innovation

1) Increase budgetary investments in energy-related R&D activities.

2) Provide enterprises with interest-discounted bank loans for their energy-related R&D projects.

3) Use tax incentives to support energy-related R&D.

## V. Policy recommendations for reforming the central-local fiscal system for energy development

1) In accordance with the minimum standards set by the state for energy development, the central government should return tax or fee/charge revenues from mine exploration to local governments. Putting revenues back in the local governments will hopefully minimize the short-term decision-making and wasteful behavior of China's primary conventional fossil

fuel production sites.

2) Disregarding the corporate ownership structure, tax incentives should be used to encourage both medium- and large-sized enterprises that use advanced technology and that have a high-rate of development and production efficiency. This would help impede the development of small-sized enterprises with high energy consumption.

3) Tax revenues from negative restrictions (carbon tax, energy tax, etc.) should either remain central government revenues or should be shared between the central and local governments. If revenue is shared, the central government should receive a larger share of the tax revenues, strengthening their capacity to manage energy production, consumption, and saving.

# Recommendations for the Reform of Environmental Levy Policies that Promote Energy Conservation and Renewable Energy Development in China

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## 1. Mobilize environmental levy revenues to support the development and deployment of renewable-energy and energy-conservation technologies

China has had pollution emission charges since 1978. Before 2003, China already assessed charges if waste water, exhaust gas, waste residue, noise, or radioactivity exceeded certain standards. Revenue from these charges was then used mainly for pollution control or for onerous loans. In 2003, this system was changed to charges being assessed for all pollutant discharges, whether they exceeded previous standards or not. According to the new Regulation, the revenue from these charges then entered the newly-established Environmental Protection Fund. This fund is used for (1) preventing and mitigating significant point and regional pollution; (2) supporting research, development, demonstration, and deployment of new pollution treatment technologies; and (3) subsidizing pollution control projects.

China's current environmental levy policy could play an instrumental role in encouraging enterprises to reduce pollution and protect the environment, in introducing the principle of "polluters pay," in internalizing externalities, and in promoting environmentally-sound technology development and innovation. However, it is still largely "terminal control" oriented. Therefore, in the short run, reforms to this environmental levy policy could be focused on improving the allocation of the Environmental Protection Fund. The Environmental Protection Fund should not only be used in pollution treatment and emission mitigation (such as installing desulphurization sets in thermal power plants); it should also be used to support the development and deployment of renewable-energy and energy-efficient technologies that reduce or avoid pollutant emissions upstream. This is better than the old environmental protection approach, "treatment after pollution."

## 2. Raise pollution charges gradually so that the levy better reflects the social cost of emissions and improve the market competitiveness of renewable-energy and energy-efficient technologies

China's present emission charges are much too low to compensate for the large social and economic cost of pollution. Taking a 600MW coal-fired power plant for example, the present charge standard is equivalent to 0.0096 RMB/kWh, but the external cost of emissions for the plant is equal to 0.0938 RMB/kWh. The levy is thus only 10.2% of the external cost.

With the present level of emission charges, the feed-in tariff for a 600MW coal-fired power plant is 0.35476 RMB/kWh while that for a 4MW industry effluent-based biogas power plant and for a 20MW wind farm are 0.40030 RMB/kWh and 0.68393 RMB/kWh respectively. Thus, the present pollution charge does little to improve the market competitiveness of renewable electricity production. If the levy were to be increased to reflect the full external cost, then the feed-in tariff for the coal-fired power plant would be increased to 0.43896 RMB/kWh. As this is

higher than the charge for a biogas power plant, such a modification would make the biogas power plant competitive.

Furthermore, present emission charges are lower than emission mitigation costs. Taking $SO_2$ emission for example, the present charge standard is 630 RMB/t, which is equal to 0.0044RMB/kWh for a coal-fired power plant. A case study done in Shandong province shows that the cost of the construction of a desulphurization unit in a new coal-fired power plant is about 0.0145RMB/kWh, which is about 0.0172-0.0225 RMB/kWh more than in existing plants. The current levy thus represents less than one third of this cost. In other words, the levy is insufficient to stimulate enterprises to adopt $SO_2$ mitigation measures.

Consequently, present pollution charges should be raised to equal the emission mitigation cost in the short- and mid-term and in the long-term should be raised to equal the full social cost of emissions. This will help to promote energy saving and the adoption of environmentally-sound technologies, such as renewable energy.

**3. Formulating a complete environmental tax and charge policy framework by integrating different economic-based environmental policy instruments.**

China's environmental levy policy reforms should aim to develop an integrated environmental tax and charge system that encourages changes in production and consumption patterns and promotes the development and deployment of environmentally-sound technologies, environmental protection and sustainable economic growth.

In addition to the current emission charges policy, fossil fuel excise taxes should be introduced in the short- and mid-term starting with a fuel consumption tax equal to 60 percent of the price of each type of fuel. $CO_2$ tax or ecological taxes should be considered in the long run.

The government should also consider setting up a general Public Benefit Fund that integrates environmental protection, energy conservation, and renewable energy development incentives. This fund, together with the Environment Protection Fund and the Renewable Energy Fund which will be established under the *Renewable Energy Law*, should allow electricity surcharges to recover the environmental costs incurred by fossil fuel consumption in electricity generation and should create incentives for pollution reduction, energy conservation, and renewable energy development. Electricity surcharges are generally set at 1 to 3 percent of the price of electricity. In China, an electricity surcharge of 0.002-0.005 RMB/kWh would be appropriate. Total electricity consumption in 2004 was about 1,903 billion kWh. If China had assessed an electricity surcharge during 2004, between 3.5 and 8.5 billion RMB would have been generated for the Public Benefit Fund.

**4. Integrating environmental tax and charge policies with voluntary actions**

Market-based and direct regulatory policy tools are not enough to reduce pollution and resource shortage. Broad public participation and changes in life-style and consumption patterns are crucial. Voluntary agreements can encourage such participation. Voluntary agreements are agreements between the government or other agencies and industries or specific enterprises wherein the industry or enterprise promises to increase energy efficiency or to reduce $SO_2$, $CO_2$ and other emissions. Volunteer agreements generally last for 5 to 10 years. During this time, the

industry or enterprise can use a variety of means to reach pollutant-emission and energy-saving targets; and, they often receive tax breaks and other economic benefits such as public fund subsidies.

China must disseminate energy-saving and renewable-energy information to raise social awareness and to attract more people and enterprises to participate in energy-saving and renewable-energy programs. Public participation has already contributed to renewable energy development abroad. Information dissemination, education, training, and popularizing science and technology, can increase social awareness of energy-saving and renewable-energy development. In turn, this can increase the voluntary purchasing of energy-saving products and electricity from renewable resources and can stimulate investment in energy saving and renewable energy by manufacturing and service companies. An educated public can further stimulate energy conservation and renewable energy development by serving as a watchdog, monitoring government and private enterprise activity in these areas.

# Policy Recommendations for the Design of the Vehicle Fuel Tax, Energy Tax, and Carbon Tax

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Based on qualitative and quantitative analysis, we recommend the quick issuing of the Fuel Tax (2006-2007), the implementation of the Energy and Environment Taxes in the mid-term (around 2010), and the issuing of the Carbon Tax in the long-term (2020). These various taxes will enhance the government's capacity to adjust China's market economy, help reduce energy consumption, positively impact environmental protection, and promote sustainable energy development.

It is necessary to consider the adoption of an energy tax in the immediate future. Appropriate fiscal policy on energy can have important consequences: it can guide public consumption and promote clean- and new-vehicle technological development. A vehicle fuel tax is an example of just such a fiscal policy. Levying a vehicle fuel tax is not a new idea; it is commonly used in developed countries. China should thus consider the valuable experience of these countries in the implementation of its own vehicle fuel tax.

The rapid increase in oil demand and vehicle fuel demand in China suggests that the use of a vehicle fuel tax could have significant and positive effects. For example, the levying of a vehicle fuel tax could have a strong impact on fuel demand for road transport. If a tax rate of 2.7yuan/liter of gasoline were adopted, for example, then energy demand for vehicles would decrease by 10.3% between now and 2010. Using a baseline scenario for comparison, this would represent approximately 16 million tons of oil saved. If a tax rate of 4.6yuan/liter of gasoline were adopted, on the other hand, then energy demand would decrease by 20%, or by around 90 million tons of oil, by 2030.

Use of an energy tax can also have a significant impact on energy use. With a tax rate of 50yuan/tce, for example, energy demand would decrease by 6.3%, or by around 123 million tce, by 2010 as compared with the baseline scenario. With a tax rate of 120yuan/tce, on the other hand, energy demand would decrease by 16.2%, or by around 400 million tce, by 2030.

An energy tax would only have a slight negative impact on GDP. In 2010, for example, GDP loss would be 0.4% and 0.36% in 2030. The main reasons for this small reduction would be: decreased output from the energy industry due to energy saving; and the impact on other sectors due to an increase in the price of energy. However, this calculation of the effect of an energy tax on GDP does not fully reflect the impact of reduced energy imports nor does it reflect new economic activity that would emerge from increased investment in new sectors. If these factors were also to be considered, then the negative impact on GDP development could be abated. At the same time, from the perspective of the GDP growth rate, there will be no fundamental change. More importantly, the concept of "green GDP" could further limit the tax's minor negative impact on GDP. Furthermore, considering the social costs of rapid energy development in China – such as the cost of energy security, the cost of extending the international market, and the environmental cost - the benefits of an energy tax levy promise to be even more significant.

From a long-term point-of-view, use of a carbon tax, or combined energy and carbon tax, would be a good choice. Use of a carbon tax has positive effects on carbon reduction and on the optimization of China's energy system - and it has a limited impact on GDP. Use of a carbon tax would stimulate new technology manufacturing in sectors such as clean-coal technology, new and renewable energy, and energy services, and would also upgrade technology in China. It would, therefore, promote economic development.

These energy-related fiscal policy options are still in the early phases of the drafting and revision process. They face some difficulties. These difficulties could appear when the policy is first adopted, but could be avoided with the adoption of countermeasures and with further studies. Some specific challenges for the vehicle fuel tax are: how to collect taxes; and, how to return tax revenues or subsidies to non-road-transport users, including farmers for agricultural production. These difficulties also exist in other countries. Some options could be selected after detailed study, though this is not an ideal *modus operandi*. A vehicle fuel tax should be adopted soon, however, because the policy will have a positive impact and the difficulties that it may present cannot be entirely avoided. Early use of a fuel tax could save significant sums of money on oil imports. Also, the recent increase in oil prices could serve as a good basis to introduce a vehicle fuel tax.

During this period of rapid socio-economic development in China, the government should announce clear policy options that will guide societal decisions that affect the long-term, such as city layout decisions, public transport development, infrastructure development, etc. Thus, it is necessary to introduce these policy options as soon as possible. In terms of an energy tax rate, it could be initiated at a lower start rate and then be gradually increased. This approach would have the benefit of avoiding a significant initial impact on public consumption and economic development.

The share of revenue from energy-related taxes represents a small portion of total government tax revenue. According to the energy tax rate used in the calculated projections above, total tax revenue will be around 500 billion yuan in 2030 with the energy tax representing around 5% of that revenue. As in developed countries, energy activities will be a major source of economic growth. Energy tax revenue should be used to fund sustainable energy development. Thus, part of energy tax revenue could be used to support energy conservation, new and renewable energy development, development of new technology, etc. The energy industry as well as energy utilization are important components of economic activity. Proper use of energy tax revenue could thus contribute to economic development, enhance national competitiveness, and provide a foundation for long-term sustainable development.

# Fiscal Instruments for Pollution Control: Attractions, Limitations, and Strategies

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Fiscal policies are an important element of the policy maker's toolkit for protecting the environment and encouraging efficient energy use. They have the potential to help bring the prices of goods and services closer to their full social cost – the private cost plus the external, environmental cost. This encourages cleaner production and consumption decisions and can enable society to achieve the best balance between environmental quality and other valued goods and services such as transportation, food, housing, and energy.

There is a wide range of potential fiscal approaches to environmental protection and efficient energy use. These include:

> **Taxes** on emissions or effluent releases (as under the pollution levy), or on goods and services associated with pollution (as with a gasoline tax).
>
> **Tax Credits** for clean consumer activities (for example, purchasing an energy-efficient refrigerator), or for clean production activities (for example, producing electricity from renewable sources).
>
> **Subsidies** to research and development toward the invention of new, clean technologies.
>
> **Policy packages:** One example is green tax reform -- a combination of an environmental levy and a reduction in ordinary income or sales taxes, where the income or sales tax cut is financed by revenues from the environmental tax. Another example is an environmental tax-subsidy package --- for example, using environmental taxes to finance either subsidies to R&D or tax credits for clean producer or consumer activities.

In my paper for this forum I address the following questions related to the use of these various fiscal instruments:

1. *What are the potential attractions and limitations of fiscal instruments?*
2. *Which types of fiscal instruments are best?*
3. *Do fiscal instruments make conventional regulation (direct controls) unnecessary?*
4. *How extensively are fiscal instruments used in various countries?*
5. *Is it worthwhile for China to expand the use of these instruments now? Or does the "Environmental Kuznets Curve" imply is better to wait until a higher per-capita income level is attained?*

## 1. What are the potential attractions and limitations of fiscal instruments?

Fiscal instruments have several attractions relative to other instruments for promoting energy efficiency or reduced pollution. Some potential attractions include:

- Cost-effectiveness. Fiscal approaches have the potential to achieve given targets for reduced pollution or reduced energy use (energy per unit of service) at lower cost than direct regulation. They can do this by helping assure that pollution-reductions are undertaken by facilities that can do so most inexpensively. In contrast, under direct controls regulators often lack the information to assure that the controls on emissions are set optimally across the various polluting facilities.

- Innovation incentives. Taxes on emissions or tax-breaks for emissions reductions provide a sustained stimulus toward technological innovation.

- Efficient source of public revenue. Taxes on emissions allow for socially beneficial "green tax reform." Such reform substitutes taxes on "bads" like pollution for taxes on "goods" like work or investment. The revenue from pollution levies or taxes on polluting fuels can be used to finance reductions in income taxes or sales taxes, which lowers the distortionary costs of the tax system.

But the policies have some drawbacks as well. A key potential drawback is that they often impose a larger share of the overall policy cost on the polluting facilities. (However, this disadvantage can be reduced or eliminated through judicious policy design.) Another potential drawback is that the costs of fiscal policies may be more visible than those of direct controls. A third issue is that with fiscal instruments regulators generally will not be able to predict in advance the extent of pollution-reduction that will occur. However, the cost of regulation (at the margin) generally will be clearer under fiscal approaches than under policies that stipulate the total allowable quantity of pollution.

## 2. Which types of fiscal instruments are best?

Two of the general fiscal approaches -- tax credits and R&D subsidies – can be viewed as "carrots" in that they reward facilities for reducing pollution or for efforts to invent new technologies for doing so. They offer a payment to the facilities. In contrast, the first approach – taxes on pollution or fuels – can be regarded as a "stick" because it penalizes facilities for producing pollution. From the point of view of social cost, which approach is best? Is it best to focus on carrots, on sticks, or on a combination of the two?

From a political perspective, it may be attractive to employ only the carrots. But this is economically wasteful. The reason is that private markets can fail in two ways, and that a combination of instruments is generally necessary to address both "market failures" most effectively.

Emissions taxes focus most effectively on a *"pollution market failure"* -- the problem of environmental externalities. The pollution generated from industrial activities is a cost to society that (absent regulation) is not borne by the polluting facility. Emissions taxes can address this problem by bringing the prices of environmentally damaging production or consumption activities in line with the full social cost. Economic analysis indicates that the environmental

benefits from such taxes will exceed the costs to facilities and society in general associated with the higher prices.

A second market failure is an *"innovation market failure"* relating to efforts to invent new technologies. Research and development activities, if productive, generate new knowledge. In general not all of this new knowledge can be appropriated by the individuals that undertake efforts to develop the new knowledge: some knowledge "spills over" to others, often competing enterprises. Economic analysis indicates that under these circumstances, public policies promoting a larger amount of R&D would in general create additional social benefits (from the new knowledge) that exceed the extra cost.

Thus two market failures justify both a carrot (the R&D subsidy) and a stick (a tax on pollution externalities). Studies indicate that the costs of achieving given pollution-reduction targets can be an order of magnitude lower if both types of policies are used, as opposed to relying entirely on technology-push policies.

### 3. Do fiscal instruments make conventional regulation unnecessary?

Emissions taxes and other fiscal instruments can remove the need for some direct controls. This is particularly the case if the instruments are introduced upstream, at the point involving primary inputs like fossil fuels. For example, a carbon tax, if imposed on suppliers of primary fuels, would encourage electric power generators to switch to cleaner fuel sources (hydro power, wind power, etc.) or to lightly taxed fuels (natural gas). There is no need for direct fuel-switching requirements.

However, several types of economic activity are not easily addressed through fiscal instruments. Emissions from mobile sources such as cars and planes are difficult to monitor. Similarly, non-point sources of water pollution are virtually impossible to identify. In these cases, direct controls such as efficiency standards or mandated technologies can have an advantage over fiscal instruments.

Thus, while fiscal instruments remove the need for some direct controls, they do not eliminate it. A system involving both types of regulation is likely to be most effective in promoting energy efficiency and a clean environment. ‘

### 4. How extensively are fiscal instruments in various countries?

These instruments are used very broadly in the more industrialized countries, and their use is significant and growing in developing countries. There is considerable variety across nations in the types of fiscal instruments used, and in the magnitudes of the relevant tax or subsidy rates. In 1997 the OECD countries relied on environment-related taxes for about five and a half percent of their overall tax revenue.

The fact that these instruments are used broadly does not necessarily imply they are used well. On the positive side, numerous studies indicate that administrative costs for emissions taxes and fuels taxes are considerably lower than the costs would be for comparable direct controls. On

the negative side, in many nations (and probably in most), the tax rates on pollution and polluting fuels are well below the marginal damages from pollution – the rate that according to economic analysis would maximize the net benefits from pollution-control. In fact, many nations employ negative rates – that is, they subsidize pollution-related goods or services. The World Bank's 1992 *World Development Report* examined fossil fuel, electricity and water prices in 22 developing countries and the United Kingdom. In all but two cases (electricity pricing by Turkey and the Philippines), subsidies caused prices to fall below cost, even before accounting for environmental externalities.

Below we discuss the tax-rate issue as it relates to China.

**5. Is it worthwhile for China to expand use of these instruments *now*? Or does the "Environmental Kuznets Curve" imply it is better to wait until a higher per-capita income level is reached?**

Using data from many countries, a number of studies have found evidence of an "Environmental Kuznets Curve" (EKC). The curve relates per-capita income to environmental quality[1], and indicates that environmental quality initially falls (or pollution rises) as per-capita increases, but environmental quality starts to improve (or pollution decreases) once per-capita income exceeds a certain threshold value. Although the estimates vary greatly, a typical threshold value is 7000-9000 U.S. dollars, or about 30,000-39,000 RMB (using exchange rates based on purchasing-power parity).

The presence of an Environmental Kuznets Curve does not offer a justification for China's postponing significant action to reduce pollution or encourage cleaner energy use. There are two important arguments against postponement.

1. Even if new, cleaner technologies will ultimately be invented, this invention will occur too late from a social-welfare point of view if vigorous energy and environmental policy is postponed. This reflects the fact that private markets generally provide insufficient incentives to innovate – this is the "innovation market failure" mentioned earlier. In addition, in the absence of policies to deal with pollution externalities, conventional, "dirty" production processes can be employed at costs below their full social cost. As a result, potential new, clean technologies will face an inefficiently large cost-challenge. This will slow the rate of market-penetration of new technologies (as well as discourage innovation).

2. A nation that postpones vigorous environmental and technology-promotion policies will suffer excessive environmental damage during the time-interval from the present until the arrival of the clean technology. Even before the new, clean technologies are invented, there is a role for vigorous environmental policy to encourage the "clean" use of *existing* technologies (for example, fuel-switching by electric generators, or use of energy-efficient appliances by consumers).

These arguments have important implications for China.

[1] More specifically, the curve relates per-capita income to emissions of various pollutants.

*Taxes on emissions and tax-credits for pollution-reduction.* With regard to the first two types of fiscal instruments mentioned – taxes on emissions or on polluting fuels, and tax-credits for pollution-reduction – it suggests more vigorous use of these instruments. To maximize the net benefits (environmental benefits minus regulatory costs from environmental regulation, emissions taxes should be set equal to the marginal environmental damage from emissions. Or, if tax-credits for cleaner production are employed, the tax-credit rate should be equal to this marginal damage. However, China's current pollution levy rates are significantly below this rate (Goulder 2005). Raising the levy rates would produce benefits (in the form of avoided health costs and other adverse impacts on humans) in excess of the regulatory costs.

*R&D support.* What are the implications for China's R&D policy? China devotes about 1.3 percent of its GDP toward R&D. Of this, about a fifth is energy- or environment-related R&D. Several studies suggest that, in the U.S., the annual rate of return to energy-related R&D is over 25 percent -- several times the market interest rate or return on private-market investments. This implies that the U.S. would benefit from devoting a larger share of its resources to energy-related R&D. Yet the U.S. already devotes a larger share of its GDP to R&D than does China. This suggests (but does not prove) that China has significant untapped R&D resources and might also benefit from an expanded focus on R&D. However, it should be noted that the type of R&D incentive is as important as the expenditure commitment. Greater rewards for research outputs rather than inputs could help improve the productivity of R&D.

## Table 1: Contributions of Environment-Related Taxes to Overall Tax Revenues for OECD Countries in 1997

| Country | Environment-Related Tax Revenue (millions of US dollars) | Total Tax Revenue (millions of US dollars) | GDP (billions of US dollars) | Environment-Related Tax Revenue as Percent of Total Tax Revenue | Environment-Related Tax Revenue as Percent of GDP |
|---|---|---|---|---|---|
| Austria | 4,865 | 91,297 | 206.7 | 5.33 | 2.35 |
| Belgium | 5,715 | 111,411 | 243.6 | 5.13 | 2.35 |
| Canada | 13,242 | 236,225 | 640.0 | 5.61 | 2.07 |
| Czech Republic | 1,501 | 20,460 | 53.0 | 7.33 | 2.83 |
| Denmark | 7,780 | 84,233 | 168.4 | 9.24 | 4.62 |
| Finland | 3,963 | 56,526 | 122.5 | 7.01 | 3.23 |
| France | 30,156 | 635,746 | 1,406.0 | 4.74 | 2.14 |
| Germany | 46,382 | 782,305 | 2,114.5 | 5.93 | 2.19 |
| Greece | 4,746 | 40,504 | 120.0 | 11.72 | 3.95 |
| Hungary | 1,292 | 17,868 | 45.8 | 7.23 | 2.82 |
| Iceland | | 2,377 | | | |
| Ireland | 2,381 | 25,772 | 78.5 | 9.24 | 3.03 |
| Italy | 37,790 | 515,237 | 1,159.5 | 7.33 | 3.26 |
| Japan | 71,388 | 1,202,355 | 4,195.3 | 5.94 | 1.70 |
| Korea | 13,333 | 101,880 | 476.9 | 13.09 | 2.80 |
| Luxembourg | 504 | 7,303 | 17.5 | 6.89 | 2.88 |
| Mexico | | 67,763 | | | |
| Netherlands | 13,668 | 158,109 | 376.7 | 8.64 | 3.63 |
| New Zealand | 1,108 | 23,553 | 64.9 | 4.70 | 1.71 |
| Norway | 5,570 | 65,676 | 155.0 | 8.48 | 3.59 |
| Poland | 2,350 | 55,936 | 143.2 | 4.20 | 1.64 |
| Portugal | 3,670 | 34,919 | 104.3 | 10.51 | 3.52 |
| Spain | 11,964 | 188,355 | 558.6 | 6.35 | 2.14 |
| Sweden | 7,276 | 122,252 | 237.5 | 5.95 | 3.06 |
| Switzerland | 5,020 | 86,729 | 256.3 | 5.79 | 1.96 |
| Turkey | 5,846 | 53,007 | 190.2 | 11.03 | 3.07 |
| United Kingdom | 38,247 | 464,383 | 1,315.7 | 8.24 | 2.91 |
| United States | 77,333 | 2,299,136 | 8,121.0 | 3.36 | 0.95 |
| **Total** | 417,090 | 7,551,318 | 22,571.6 | 5.52 | 1.85 |

***Source:*** **OECD**

## Table 2: Science Development Indicators

| Country | 1987-1997 R&D Expenditure as % of GNP | 1987-1997 No. of Scientists Engaged in R&D per Million | 1987-1997 No. of Technicians Engaged in R&D per Million | 1997 No. of Patent Applications per Million |
|---|---|---|---|---|
| | | | | |
| Australia | 1.80 | 3357 | 797 | 2342 |
| Denmark | 1.95 | 3259 | 2644 | 14076 |
| Finland | 2.78 | 2799 | 1996 | 12709 |
| France | 2.25 | 2659 | 2873 | 1681 |
| Germany | 2.41 | 2831 | 1472 | 1889 |
| Japan | 2.80 | 4909 | 827 | 3182 |
| Spain | 0.90 | 1305 | 343 | 2137 |
| Sweden | 3.76 | 3826 | 3166 | 9482 |
| United Kingdom | 1.95 | 2448 | 1017 | 2192 |
| United States | 2.63 | 3676 | - | 2342 |
| Mid-Income Countries | 2.00 | 2662 | 14439 | 5815 |
| China | 0.66 (1.31 in 2003) | 454 | 233 | 43 |

*Source:* WU Jinglian, "Which Path for Industrialization? A Choice for China." Presentation at inaugural conference for Center for Industrial Development and Environmental Governance, Tsinghua University, Beijing, China, September 28, 2005.

*Note:* Approximately a fifth of China's R&D is devoted to energy or environmental-treatment technologies (www.863.org.cn/english/annual_report/annual_report_2002/pdf).

# Designing Corresponding Policies for the Implementation of the *Renewable Energy Law*

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## I. Background

The *Renewable Energy Law* was passed on February 28th, 2005 during the 14th Meeting of the Standing Committee of the Tenth NPC. It will be effective on January 1st, 2006. The *Renewable Energy Law* underlines the importance of renewable energy for sustainable economic and social development in China. It outlines policies and requirements for resource survey and planning, scientific research, industry development, investment, pricing and taxation for renewable energy, as well as the responsibilities of the government, enterprises, and users in the development of renewables. In sum, the *Renewable Energy Law* lays down a legal framework for renewable energy development in China. This framework consists of the following key elements: (1) establishing national mid and long-term renewable energy development targets, and achieving the targets through formulation and implementation of national and provincial renewable energy development plans; (2) formulating renewable energy feed-in tariffs, and requiring grid companies to purchase 100% of the electricity from renewable sources at the feed-in tariff or bidding price; (3) allocating the difference between the feed-in tariff and the average conventional power price to all consumers nation-wide.

Figure 1 illustrates energy pricing within this framework.

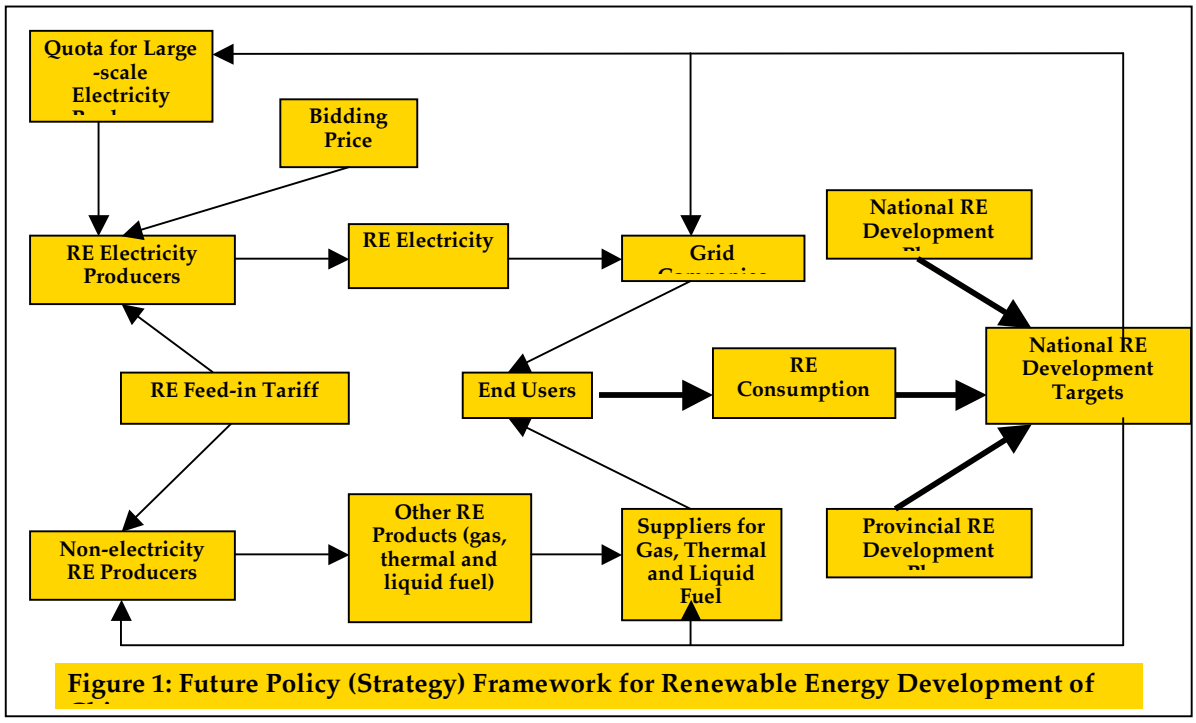


**Figure 1: Future Policy (Strategy) Framework for Renewable Energy Development of**

The national targets (in terms of total volume) for the development and use of renewable energy should be clearly stipulated by the national development plan, while provincial targets should be clearly stipulated in provincial development plans. In order for the national *Renewable Energy Law* to achieve its objectives, these targets should be made into concrete policies or regulations.

## II. Problem

- The rules designed in the *Renewable Energy Law* are meant to be overarching principles adaptable to the different situations in each of China's regions. Efficient implementation of this law depends on the development of corresponding administrative rules and codes, and of technology standards. If these rules, codes, and standards are not well-designed and issued before the end of 2005, the enforcement of the *Renewable Energy Law* will be affected.

In addition, the currently approved version of the *Renewable Energy Law* does not include a quota system. According to the suggestions for revision made by the Law Committee of NPC during the first review of the *Renewable Energy Law*, the Energy Authority of the State Council

should establish a quota system for power generators in due time to ensure that China reaches its national renewable energy development target.

## III. Recommendations

Considering the urgency and significance of formulating implementation regulations for the enforcement of the *Renewable Energy Law*, we put forward the following recommendations:

### 1. Important regulations must be published before the end of 2005

**(1) Establish national renewable energy targets and development plans**

Legally binding renewable energy development plans are essential to achieving national renewable energy targets. So far, the National Development and Reform Commission (NDRC) has finalized the National Renewable Energy Development Plan. We recommend that the State Council approve this plan as soon as possible. To guarantee the realization of this plan, we recommend the responsible energy management agency impose mandatory renewable energy quotas to larger renewable energy power producers, and issue respective management methods at an appropriate time.

**(2) Formulate grid-connection electricity prices (feed-in tariff)**

For renewable energy power generation technologies that are close to industrialization, such as wind power and biomass power, the government should formulate feed-in tariffs that are high enough to attract large-scale investment. Currently, NDRC has finished the draft rules for renewable energy tariff-setting. According to the draft rules, feed-in tariff for wind power and biomass power consists of two parts: the benchmark price and the subsidy price. The benchmark price is based on the average conventional power price of each province in 2005; the subsidy price is set at RMB0.25/kWh. Starting from 2007, the subsidy price will decrease by 2% per year for newly installed capacity. We recommend the rules be issued before the end of 2005 and be reviewed every few years after implementation.

**(3) Establish a cost-sharing mechanism**

We recommend that all consumers should share the difference between the feed-in tariff and the average conventional power price, through an electricity surcharge. Local consumers should share extra subsidies above the feed-in tariff provided by the provincial government.

**(4) Setting up a Renewable Energy Development Special Fund**

We recommend that the Ministry of Finance issue methods for the collection and management of the Renewable Energy Development Special Fund before the end of 2005.

If these regulations can be established before the end of this year, then the *Renewable Energy Law* can be effectively implemented starting January 1st, 2006. Other measures that also should to be in place, but are not prerequisites for the implementation of the Renewable Energy Law include: (1) preferential taxation policies; (2) codes and standards for renewable energy technology; and (3) capacity building.

**2. Establish a supervision mechanism for the implementation of the *Renewable Energy Law***

There are many government stakeholders involved in the implementation of the *Renewable Energy Law*. The energy system and pricing mechanism are in the reform process, while public involvement in social supervision remains very weak. NPC should establish a supervision mechanism to track and evaluate the implementation of the *Renewable Energy Law*. NPC should also push to form a sound government management system, market system, and to create an environment of social supervision. This will ensure the effective implementation of the *Renewable Energy Law*.

# Policy Recommendations for the Immediate Revision of the *Energy Conservation Law*

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Various countries around the world share the view that saving resources and protecting the environment is a key issue and a matter of shared concern. The Chinese government attaches much importance to implementing a strategy for sustainable development that will include energy saving as one of its top priorities and will accelerate the construction of a resource-saving and environmentally-friendly society.

Since the ratification of the *Energy Conservation Law* on November 1st, 1997 and its implementation on January 1st, 1998, energy saving has been subject to legalized administration and for the first time, its long-term strategic position in China's economic development has been stipulated. Since the implementation of this law, relevant departments of the State Council have successively formulated and issued matching laws and regulations. The following are several examples of this legislation:

- *Energy Saving Regulatory Measures for Key Energy Users*
- *Regulatory Measures for the Certification of Energy Saving Products*
- *Regulatory Measures on Saving Electricity*
- *Stipulations on the Development of Combined Thermal Power Generation*
- *Technical Stipulations on the Feasibility Study for Combined Thermal Power Generation Projects*
- *Stipulations on Energy Saving for Civil Constructions*
- *Stipulations on the Compilation and Evaluation of Energy Saving* (in the *Feasibility Study Report for Fixed Assets Investment Projects*)

Energy saving laws and regulations have been enacted in over 20 provinces and cities, and an Energy Saving Supervision Center has been established in provinces and cities like Shanghai, Yunnan, Gansu and Jiangsu, where supervision of law enforcement regarding energy saving is done with legal authorization from the government and financial support from the financial authority. In provinces and cities like Zhejiang, Jiangsu, Beijing, Tianjin, Shandong, Ningxia, Shannxi, Sichuan, Jiangxi, Shanxi, Hebei, and Guizhou, special funds are appropriated from the financial authority so that provincial energy saving centers supervise the energy saving by enterprises and regulate the supervision of energy saving according to the law. These practices thus advance and deepen local efforts to save energy. Some compulsory energy-efficiency standards for energy-consuming products, such as industrial equipment, home appliances and light fixtures, have also been formulated. The certification of energy-saving products is under development and the energy saving administration of key energy users has been strengthened.

However, with the reform of China's economic system and governmental organizations, significant change has occurred to the state's regulatory system. This has had several consequences: (1) promotion of energy saving; (2) advancement of energy-saving techniques; (3) establishment of a mechanism for social energy saving and for dealing with energy supply and

non-observance of energy laws; and (4) discovery, during enforcement of the *Energy Conservation Law* of areas where law enforcement is deficient or absent.

It can be seen that the *Energy Conservation Law* has been formulated based on regulatory practices for energy saving used under the planned economy. In terms of its design, it is mainly based on administrative instructions. An energy-saving system that conforms to a market-oriented economy, combining compulsion with mechanisms for encouragement, and providing enhanced service, has not yet been formulated. With further reform of China's market-oriented economy and changing governmental functions, the administrative system for energy saving formed under the planned economy has gradually broken-down and formerly effective approaches have been made ineffective. Moreover, original energy saving administrative organizations under various State Council departments have been basically cancelled due to the adjustment of governmental organizations. Since statistical departments are responsible for the accounting and release of energy saving indices, macro administration of energy saving is being weakened. However, the government is making new explorative efforts in energy saving administration and energy saving policy, and has accumulated some successful case studies regarding employing market mechanisms. This indicates that governmental approaches to administering energy saving are evolving.

As a result, there are frequent suggests to revise the *Energy Conservation Law*. The following points outline the current revision process.

1. **Fundamental issue: Energy saving administrative system formed under the existing *Energy Conservation Law* is unable to meet the new development trends in energy saving that are a result of deepening reform of the market-oriented economy and changes in governmental functions.**

1) The existing Energy Conservation Law, formulated during the 1980 and 90s, is based on regulatory practices for energy saving under the planned economy, and so its provisions have distinctive features of the planned economy. For instance, the government selects and determines energy investment projects, formulates energy investment plans and approves engineering projects. As for system design, the law is mainly based on administrative instructions, such as a quota-based administration.

2) With further reform of China's market-oriented economy and change in government functions, the original system of energy saving administration is breaking-down and formerly effective approaches such as a quota-based administration, awarding saving, and punishing excessive use, have been gradually made ineffective. Moreover, original energy saving administrative organs under various State Council departments have been basically cancelled due to the adjustment of governmental organizations. Since statistical departments are responsible for the accounting and release of energy saving indices, macro administration of energy saving is being weakened.

3) The government is making new explorative efforts in energy saving administration and energy saving policy, particularly with regards to the use of market mechanisms such as voluntary compliance agreements for enterprises, energy administration by contracts, and the establishment of a system to indicate energy efficiency. The government has also accumulated some successful case studies. The Green Lighting Program is one example that has had great results; it introduces a new mechanism through governmental guidance and market-based operations. Governmental approaches to energy saving administration have broken with the original framework of the original Energy Conservation Law and are evolving. The new approaches are "government-guided, market-adjusted, society-

administered and serving [of] the public." These basic principles, subject to formal confirmation by law, will create a fundamental legal framework for governmental intervention aimed to improve energy efficiency.

**2. Industrial energy administration: excessive use of administrative means, insufficient use of market mechanisms, and inoperable system design**

- The *Energy Conservation Law* pays more attention to the administration of industrial energy and stipulates that there be multiple administrative systems. However, most of them are based on administrative means, and an effective mechanism is absent.
- The design of existing systems is imperfect; for example, neither the energy-saving check system for fixed assets investment projects, nor the administrative system for key energy users, provides procedures for supervision or for evaluating standards. They also do not provide an outline of legal responsibilities. Thus, the actual results from the implementation of these systems have been unsatisfactory.

**3. Traffic-related energy administration: an absence of legislation**

The automotive industry has one of the fastest growth rates of in energy consumption. This sector has tremendous potential for energy saving, but the existing *Energy Conservation Law* provides no stipulation for energy use resulting from China's rapidly growing transportation sector. This absence of legislation greatly inhibits improvement in the efficiency of energy use in the automotive sector as well as any research on the possibilities of energy saving. A quickly rising number of vehicles on the road in China has contributed to rapid growth in energy consumption. It is of the most urgency to develop legislation regarding the administration of energy as it corresponds with China's traffic situation.

**4. Building energy saving administration: legal provisions are mostly guidelines, and do not include restrictions or clauses for implementation**

Building energy consumption accounts for over 20% of the nation's total terminal energy consumption. According to estimates, the energy saving potential over the next 20 years will mainly be in the building sector. This projection is fully supported by the experiences of various countries which show that preconditions for successful building energy saving is that government formulate powerful laws and regulations, enforce energy saving standards and economic development policies, and establish financing channels.

However, in the existing *Energy Conservation Law* this is merely listed as a principle in the chapter *Progress of Energy Conservation Technology*: "design and construction of buildings shall conform to relevant laws and administrative rules and use energy saving architecture, materials, equipment and products to improve insulating performance and to reduce energy consumption due to heating, refrigeration and lighting." More binding, legal provisions and policy that would encourage abiding by these rules is absent, making it difficult to establish relevant administrative systems.

**5. Ineffective administration of terminal energy-consuming products**

Administration of energy saving by the state has been changing from direct administration of enterprises to indirect administration. The focus of governmental energy-saving efforts has also been changing from administration of enterprises' production process to administration of terminal energy-consuming products. As a result, terminal energy-use efficiency is

becoming the most decisive and also the most critical link in the whole energy value chain. More and more studies suggest that an energy efficiency indicator and energy efficiency standards are one of the most effective means for improving terminal energy efficiency. On March 1, 2005 China formulated and enacted *Administrative Measures on Energy Efficiency Indication*.

The *Energy Conservation Law* stipulations on an energy efficiency indicator and energy efficiency standards are quite simple. Article 26 stipulates "energy consumption index shall be truly indicated in product descriptions and product identifications by organizations or individuals producing energy consumption products." Article 14 authorizes administrative departments in charge of standardization under the State Council to formulate national standards relating to energy saving; the article also authorizes the relevant State Council department to formulate legally-binding industrial standards for energy saving. Article 18 requires that a voluntary certification system be developed for enterprises' energy-saving products. **Obviously, these stipulations are unable to meet current development trends and cannot provide sufficient support for downstream laws. Additionally, the law barely involves market mechanisms or the establishment of encouraging policies and measures, and it does not show the effect of energy saving by governmental organizations.**

**6. Issues relating to the execution of the *Energy Conservation Law***

1) The *Energy Conservation Law* provides unclear stipulations on the legal status of administrative departments in charge of energy saving. Since the reform of governmental organizations (not including the National Development and Reform Commission, which designates specific organs to be responsible for energy saving), departments have been left with very few organs to deal with energy saving, and the level of influence of any such organ is either very low or non-existent. Thus, energy saving is not a priority for the leaders of other related departments. Consequently, it is impossible to secure interdepartmental coordination and cooperation that means that actual execution of energy saving policies encounters considerable difficulties and problems;

2) The government's "policy" function is not separated from its "supervision" function and a special supervisory organization is absent; as a result, any guarantee of administrative supervision is unavailable during the law enforcement process;

3) The *Energy Conservation Law* pays insufficient attention to strengthening the establishing of service organizations. As proven by legal practices for energy saving employed by many countries, organizational development is critical to the successful implementation of energy saving and energy-efficiency projects. However, the public and private sectors should each have different responsibilities. Policy and administrative functions should be reserved for governmental organizations, while consulting services, training and other services should be provided by the private sector;

4) The *Energy Conservation Law* has obscure stipulations on funds, so it is hard to ensure the quantity and use of the funds. In addition, there is no binding agreement regarding these funds, making complete implementation unlikely. According to the experiences of other countries, it is specifically stipulated in the *Energy Conservation Law* that an Energy Saving Fund be established and that a special organization be authorized to collect, manage and allocate the Fund's funds;

5) For some critical systems, definite legal responsibilities and restrictions are not stipulated.

**Suggestions for the revision of the *Energy Conservation Law***

First, the following general rules should be considered to promote energy efficiency:

1. A "basic" *Energy Conservation Law* should include energy saving policies; consequently, summarizing existing energy saving policies is important.
2. Ideal energy saving legislation should result from a participative policy-making process so as to permit the participation of all stakeholders.
3. The *Energy Conservation Law* should provide a legal framework for the increase of business opportunities.
4. Financial and nonmaterial encouragement should act as the tool to achieve scheduled energy-saving and energy-efficiency objectives, while "control mechanisms" should be based on restrictions or on performance and should be updated regularly.

Second, the following suggestions should be considered for industrial energy administration, building energy saving, traffic energy efficiency as well as product energy performance standards, energy efficiency indicators and legislative techniques:

1. For industrial energy saving, the administration of key energy users should be strengthened. The establishment of regular training and qualifications certification for national energy engineers is the prerequisite for effective implementation of energy saving projects. Energy saving consulting should be provided and enterprises should be encouraged to conduct external energy auditing. Government "control mechanisms," "market-regulating mechanisms," and "society-adjusted mechanisms," should be combined organically to encourage enterprises to explore their energy saving potential. Incentives put into practice have been found to be effective, and should be included in the *Energy Conservation Law* in order to encourage their widespread use.
2. A national *Energy Conservation Law* should include a chapter used to describe basic components of energy saving policy on building energy consumption. The law should prescribe which authorized organization will be responsible for the establishment and supervision of building standards.
3. The *Energy Conservation Law* shall designate dedicated chapters and sections for stipulations on traffic energy saving. The *Energy Conservation Law* may establish a system to set fuel economy standards and a performance indicator plan, encourage public transit development, require that an automobile's fuel consumption be indicated in advertisements, and use financial and tax incentives for automotive fuel economy and to develop new types of fuel.
4. The *Energy Conservation Law* should authorize certain bodies to implement energy performance standards and energy indicator plans, to include regular updating mechanisms and to provide local authorities with certain legislative flexibility so that they can formulate and implement advanced energy-efficiency standards that are stricter than national ones.
5. In terms of legislative technique, energy-saving laws and regulations should be reviewed regularly by appropriate governmental departments or organizations so that they accurately represent governmental policies. Energy-saving legislation should include a mechanism for its execution and should designate corresponding governmental organizations and intermediary servicing organizations to be responsible

> for the enforcement of the existing law. The government's supervisory function shall be separated gradually from its policy-making function. A corresponding supervisory organ should be established according to requirements for industrial development. And, a modern supervisory system should be established to supervise enforcement of the law so that the governmental department in charge will focus on policy-making. Even more importantly, an "inhibiting mechanism" should be established between the government's supervisory and decision-making organs.

Many countries have strict legal regulations about energy saving and adjust and revise legal provisions according to socio-economic development and change. Japan's achievement in energy saving is acknowledged globally. Japan's energy saving law is strict and functions well. Since its enactment, Japan's energy saving law has been revised each year and sometimes even twice within one year; it is currently being revised for the eighth time and the ninth revision is under preparation. At a high-level forum on construction of an energy-saving society held on June 25, 2005, Vice Premier of the State Council, Zeng Peiyan, emphasized that excessive and extravagant consumption of resources should be stopped and relevant laws and regulations should be perfected. He stressed that the *Energy Conservation Law* should be revised **as soon as possible**, that a law promoting energy saving should be formulated, and that corresponding laws and regulations as well as codes, standards and policies, should be implemented Furthermore, administration and supervision of energy-saving efforts should be strengthened and more energy should be put in to law enforcement and construction of the judicial system to ensure that relevant laws are enacted, observed and strictly enforced, and that law-breakers are duly prosecuted. It can be concluded that there is a commonly shared view on the revision of the *Energy Conservation Law*. It is our hope that through the joint efforts of relevant departments, the revision of the *Energy Conservation Law* will be included in the NPC's agenda within the coming year. We expect that a revised, highly operable, strict, normative, and comprehensive *Energy Conservation Law* will be implemented soon.

# Suggestions on Accelerating the Revision of the *Electricity Law*

*Ye Rongsi*
*China Electricity Council*

The *Electricity Law* was approved by the Standing Committee of the National People's Congress in December of 1995 and came into effect on April1, 1996. The law has thus been in place for ten years and is now in urgent need of revision due to environmental concerns and to structural economic reform. Revision of the law was included in the State Council's legislative agenda in April 2003 and was set to be carried out jointly by the State Development and Reform Commission and the State Electricity Regulatory Commission. Up until now, as an industrial association, the China Electricity Council (CEC) was authorized to analyze related international experiences. CEC then delivered policy recommendations for the law's revision to government agencies.

It has been two and a half years since the State Council formally issued its legislative agenda. Progress on the reform was quick early-on, but slowed, and is now essentially stagnant. In 2003, the State Development and Reform Commission and the State Electricity Regulatory Commission focused their efforts on the revision. They assembled capable leaders and experts, and pooled necessary manpower and material resources. As a result of CEC's support and coordinating efforts, the reform was able to make satisfactory progress under the leadership of central and local governments. Thus, by the end of 2003, a draft of the revised law was submitted for examination. Once again, however, there is tension between demand and supply of electric power. However, new difficulties have arisen that are impeding quick implementation of a revised form of the *Electricity Law.* These new problems include: obstacles in the reform of the electric power system; and, lack of cooperation between certain departments on major issues such as power price regulation and supervision function. For example, examination of the revised law by the national legislature has been held up, as the draft of the revised law is still locked in the departments of the State Council and so has yet to be submitted officially to the State Council. Compared with the current *Electricity Law*, the draft completed at the end of 2003 and submitted for examination is very different, containing major alterations and improvements. The new version of the law adapts to the demands of electric power reform, of electric power industry development and of stable and reliable electric power supply. After further revisions to chapters and clauses, the new draft will be ready for the State Council's examination and approval. We hereby make the following recommendation:

(1) Submit the revised draft as soon as possible; the law's revision has been stalled already for more than one and a half years. Most of the drafting and revising of China's laws is done by departments chosen by the State Council. Often, two or more departments are expected to work jointly on the same piece of legislation. Each individual department has its own special interest. As a result, changing the individual departments' benefits will cause problems of coordination between departments as this will adjust the departments' authority and management. It is also difficult for all of the departments at the same administrative level to enjoy the same level of benefits. And, since there is no legal arbitration system, the revision process is slowed considerably and sometimes brought to a complete stop. If we cannot reach an agreement on certain clauses during

the revision process and prior to the law's submission, then we suggest that they be brought to arbitration under the supervision of State Council leaders.

(2) Take into consideration changes in legislation regarding the environment. For example, during the 2003 revision of the *Electricity Law*, the *Renewable Energy Resources Law* was being drafted by the influential Environment and Resource Committee of the National People's Congress. This law has since been approved by the Standing Committee of the National People's Congress (February 2005) and issued by order of the National Chairman; it will come into effect on January 1, 2006. In accordance with the legal system's principle of consistency, much "link-up" work must be done during the revision of the *Electricity Law*. In other words, regulations clearly stipulated in the *Renewable Energy Resources Law* should not be repeated in the *Electricity Law*; only necessary supplementary stipulations should be added. Since the *Electric Power Supervision Regulation* came into effect on May 1, 2005, corresponding adjustments should be made to clauses pertaining to the electric power market and to supervision of the electric power industry. Furthermore, a national *Energy Law* is due soon to be drafted; thus, there will also need to be coordination between this *Energy Law* and the *Electricity Law*. For example, the *Energy Law* can include objectives and strategic issues concerning the general use of energy that are also present in the *Electricity Law*, such as structural improvement of power-generating resources, and a focus for 2000-2020 on hydroelectricity and on nuclear electricity.

(3) Formulate better regulations in order to strengthen electric power reliability. In the final draft of the *Electricity Law* submitted for evaluation, the issue of electric power security (including reliability management) occupies a major part of the document. The security of electric power and of the electric power network concerns everything from the national economy to people's lives and social stability. However, there is as of yet no regulation about the standards or guidelines of electric power's reliability nor of electric power's management. In the newly-issued *U.S. Energy Policies Law* (August 2005), a "Reliability Standard" is mentioned approximately 40 times in 1720 pages. The setting of a "Reliability Standard" comes from the experience and lessons of the electric power failure in the US and Canada in 2003. The law therefore includes a new section entitled, "Reliability Standard," added in Chapter 12 under the heading "Electric power." According to this new section, hitherto voluntarily-executed reliability standards issued by electric-reliability organizations (ERO) (here, ERO mainly refers to the Reliability Council of North America) will become compulsory under law. That is, these reliability organizations will be authorized to penalize proprietors, operators, and users of electric power networks for illegal activity; and, this in accordance with the parameters stipulated by the law. This U.S. law and others similar to it should serve as a reference during the revision of China's *Electricity Law*.

(4) Flesh-out the section on demand-side management of electric power. The lack of substance in the current revised-draft does not do justice to its important role and function. It should be clearly stipulated that the nation encourages resource development on the demand-side of electric power and considers this development a part of overall electric power development. It should also be stipulated that electric power network corporations or electric-power-selling enterprises act as the main bodies for implementation of demand-side management (DSM) and for enhancing efficiency of

electric power utilization. The State Council and local governments should also be required to support and guide DSM by enacting supportive policies and by setting up public interest funds for electric power. In addition, relevant structures and organizations (e.g. the Electricity Regulatory Commission and electric power network corporations) should assume the responsibility of making and carrying out short-, medium- and long-term plans and of providing suggestions as to how to balance supply and demand. There should also be effective planning of energy resources.

(5) Make the *Electricity Law practical*. China's legal system is quite different from the American system, which has very specific and detailed clauses within each law or regulation. China needs to change the legislative principle. Used since the early stages of structural economic reform, that legislation should be very general and not overly detailed. We recommend that the *Electricity Law* **not** be too general, but rather be detailed and provide specific guidelines. We further suggest that clauses in the *Electricity Law* concerning quantifiable targets and policy measures be more precisely quantified. In other words, time limits should be clearly defined when enacting administrative regulation. Also, the main organisms that will be responsible for law enforcement should be clearly defined and the relevant reporting and responsibility-inquiring system should be set up. These revisions will make the *Electricity Law* legally-binding and efficient.

# Recommendations for a National Energy Law

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China's energy legislation has made rapid progress since the 1990s, and the establishment of a market economy. Several important energy laws and regulations, such as the *Coal Law, Electricity Law,* and *Energy Conservation Law*, have been enacted, and local and sector administrative regulations have been established. In the first part of 2005, the National People's Congress passed the *Renewable Energy Law* which will come into effect on January 1, 2006. With the promulgation and implementation of this series of energy laws, energy development and utilization in China is moving to gradually comply with them.

With the deepening of socialist market reform, the rapid development of the energy industry, and the new changes in energy supply and demand, current energy legislation cannot meet the requirement of overall law-based energy management. One problem is that the existing collection of energy laws is incomplete and lacks one national "basic law" that would act as the primary piece of legislation, unifying all existing energy laws.

China is second only to the United States in its production and consumption of energy. Much energy is needed if China hopes to maintain stable and sustainable, yet rapid economic growth in the first two decades of the 21st century and improve the standard of living. However, China is being confronted with severe energy supply problems. Energy is one of the key components of economic growth, and energy supply security will determine whether China can or cannot realize its goal of building a "Xiao Kang," or "comfortably well-off," society by 2020.

China has historically depended on policy to arbitrate between the need for energy and resource availability, but in the long-term, energy legislation should handle this arbitration. While short-term policy adjustments may be effective, they are only weakly enforced by the State and do not garner the public's attention. It is crucial to first develop a national energy strategy and, second, to formulate an energy law that will guarantee this national energy strategy will be fulfilled. With no national energy law, the formulation and modification of laws and regulations is un-coordinated and lacks a common objective. Different viewpoints put forward in individual laws and regulations influence the legislative process, and attenuate the laws' real effect, even in the short-term. A very professional and detailed special regulation on energy would be easily adapted to deal with overall social development or the comprehensive use of energy resources. National "basic laws" will define the legal status of China's energy development strategy, the principals for energy structuring adjustment and energy planning, the legal system for energy security insurance, the coordination of primary- and secondary-energy, and the applicable principals for energy taxation and pricing. It is urgent, now more than ever, that China adopts a national energy "basic law." Enacting such a law will reinforce the transparency of China's energy development and will help to alleviate the worries of international actors about China's high demand for energy.

Recommendations for the formulation of a national energy law：

(1) Define the legal status of the national energy development strategy, which will consequently determine how future adjustments are to be made in the legal relationship between parties involved in energy development and use.
(2) Provide unified guidance for all energy-related documents and regulations.
(3) Adjust the energy legislation system and ensure that this legislation is effectively incorporated into an overall legal framework for energy-related issues.
(4) Provide a basis for enforcement of energy laws, for judicial review of energy-related issues, and for the filing of lawsuits for energy-related cases.
(5) Provide for the creation of a legal framework for energy-related issues that effectively unifies and coordinates existing energy laws so as to reinforce, and not lessen, the substance and precision of these laws.
(6) Improve China's international energy development and cooperation, and take measures to deal with global climate change.

China should use the experience of other countries in the domain of energy law enactment as a reference. On August 8, 2005, U.S. President George W. Bush signed into law the new *2005 State Energy Policy Act*. This act is the most far-reaching and all-encompassing of its kind to be passed in several decades, including 18 articles and over 420 clauses in more than 1,720 pages. The main issues it addresses are (1) providing preferential taxation (e.g. a preferential consumption tax) or tax reduction, (2) promoting commercial and household energy efficiency, (3) setting new lowest-energy-efficiency standards, (4) abolishing outdated and unfavorable regulations on investment in infrastructure, (5) reinforcing national energy infrastructure (e.g., the domestic network), (6) restarting construction of nuclear electricity-generating facilities, (7) promoting the development and use of renewable energy, (8) supporting high-efficient automobile production, (9) reducing the reliance on overseas energy. Critics of the *2005 State Energy Policy Act* claim that "it ignores the development of energy efficiency and clean energy," that "it is rather an oral statement than a real action," or that "it puts more emphasis on big traditional energy companies, and cares less about the global environment and change [in the] climate." China should research both the successes and shortcomings of international experience in formulating their own legislation.

China should also consider several fundamental concepts evident in international legislation. International energy legislation is designed to be able to adapt to an evolving energy situation and to modify outdated clauses in a timely fashion. Implementation of this legislation is intended to be feasible. The legislation itself contains clear regulations on punitive measures to be taken in cases of infraction, it names the bodies responsible for enforcing the rules set out in the laws, and it creates an effective supervision system.

We further recommend that both the research and the drafting of a national energy "basic law" be incorporated into the State's "11$^{th}$ Five-Year Plan." This is an urgent and important task for the State Legislative Institute and for the State Council departments involved.

We should also adopt "best-practice" international energy policies, placing emphasis on the new energy situation, and stressing both effectiveness and coherency of legislation. Following the example of China's *Renewable Energy Law*, we should standardize prior legislation and welcome the advice of international experts in this process. We shall assemble experts from relevant departments, academies, organizations, energy industry enterprises, and scientific research and higher institutions to discuss and draft a national energy law in less than three years.

By enacting the *Energy Law*, we can realize the coordination of energy supply and consumption, and the sustainable social development of energy development and use, energy saving, and trade. Also, the general public, legal representatives and organizations should be expected to comply with this energy strategy. In order to build a resource-efficient and environmentally friendly society, we should incorporate scientific concepts in to the energy legislation process. We suggest the following legal principals for national energy law: (1) a uniform legal system; (2) guaranteed energy security and sustainable development; (3) principles of a socialist market economy; and (4) energy laws that are practical, realistic and effective. These principals will also be the guidance for energy related law and the regulation's establishment and revision.

# China's Sustainable Energy Development Strategy

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## China's Current Energy Outlook

Energy consumption in China is growing rapidly. Since 2003, China's energy consumption growth rate has exceeded its economic growth rate. The average energy consumption elasticity coefficient rose from 0.5 in the 1980s to over 1.0, all the way to 1.6, in 2004. Judging from the growing energy consumption rate in the first several months of this year, the energy consumption elasticity coefficient will also be above 1.0 this year. Such large growth in energy consumption indicates China's current economic growth is based on size expansion with low efficiency and high-energy consumption. China's industrial structure is tilted toward heavy industries that consume large amounts of energy and other resources. Such rapid growth in energy consumption is unsustainable.

Table 1 China's Energy Consumption Elasticity Coefficient since 1980

| Time | Annual Average GDP Growth Rate (%) | Annual Average Energy Consumption Growth Rate (%) | Energy Consumption Elasticity Coefficient |
|---|---|---|---|
| 6th Five-Year Plan | 10.7 | 4.9 | 0.46 |
| 7th Five-Year Plan | 7.9 | 5.2 | 0.66 |
| 8th Five-Year Plan | 12.0 | 5.9 | 0.49 |
| 9th Five-Year Plan | 8.3 | 0.6 | 0.07 |
| 10th Five-Year Plan (First 4 Years) | 8.8 | 9.6 | 1.09 |
| Including: 2001 | 7.5 | 4.3 | 0.57 |
| 2002 | 8.3 | 7.4 | 0.89 |
| 2003 | 9.3 | 13.0 | 1.39 |
| 2004 | 9.5 | 15.2 | 1.60 |

Source: Collated according to the reports and internal data of the National Bureau of Statistics of China

Energy shortages over the last two years have led to an overexploitation of conventional energy. Last year, new power generators were installed to increase the power capacity to 50.5 GW; however, it is likely that these power generators are insufficient– power requirements are projected to exceed 70 GW this year. The disorderly competition in electric power construction has increased unit capital cost and rendered it difficult to make full use of the electrical power technology and optimize power generation structure. Numerous small- and medium-sized power generators are still being constructed, and the proportion of coal-driven power generators is still increasing. Because of increases in the price of coal, coal production has been increased by 200 million tonnes annually over the last two or three years. With lots of idle capital vying for the excessive profit, the coal industry has become a rent-seeking hotspot for capital and power.

With the control of national macro-control policies, there has not been excessive investment this year. There are signs of saturation in the real estate and high-energy consumption market. Tension in the energy market has also been eased. Although power shortages are still pervasive, the scope and duration of blackouts have significantly decreased this year. In addition, the upsurge in coal prices has slowed down as well.

Although many reforms are being made, the structure and quality of this round of energy growth and supply/demand equilibrium re-adjustment is still not good enough. Due to the lack of strategic long-term arrangements and emergency schemes, the development of the energy industry still follows the traditional, high-energy-intensity expansion route. The proportion of coal as a primary energy source continues to rise. The excessive production of coal has exacerbated resource competition and safety issues. Moreover, the structure of power generation has been further tilted toward coal.

Due to policy and regulatory reasons, nuclear power has actually been marginalized in this phase of rapid power expansion. With the current pace of power development, the installed capacity of China will be over 800 GW in 2010. However, no new nuclear power capacity will be installed until 2010. By the end of the 11th Five-Year Plan period, the coal demand of coal-driven power generators, metallurgy, and building industries alone will reach approximately 2 billion tonnes.

Dependence on foreign oil is increasing at 40 percent, and this trend is likely to continue, if not increase. Not only do fluctuations in international oil prices hurt China's economy, but they also makes it more difficult for China to improve its energy supply since it increases China's dependency in using foreign oil and gas resources.

Excessive coal mining and combustion worsens the environmental situation in China as well. Water resources and the environment are polluted during the production of coal. Consequently, sulfur dioxide emission has significantly risen recently, which has not only increased the amount of greenhouse gases but also made it difficult to realize the 11th Five-Year Plan's air pollution control target.

China has a large population but relatively scarce resources. The coal-dominated energy structure has led to low energy efficiency. In the long run, the damage coal mining inflicts on water and land resources and ecology will be more serious than the air pollution caused by coal burning. Currently, exploitation of coal has exceeded the resource limitation for safe production. Although rigorous safety management measures are already in place, it is still difficult to solve the safety problems at the present production level, let alone sustain it at a higher production level in the future. Therefore, it is very difficult to solve the problem of energy supply in China by relying on the increase of coal production. Furthermore, it is difficult to increase oil production as well.

The potential for increasing of natural gas use is tremendous, but it is difficult to raise production to meet current demands. Judging from the current resource situation, conventional energy production will approximately be equivalent to 2.4 billion tonnes of coal in 2020. Hydropower and other renewable energy can only provide 2.7 billion tonnes of primary energy by 2020. In the end, this shortfall has to be met by importing energy from other countries. Therefore, the constraint of energy in China is a long-term strategic issue.

At present, many people are overoptimistic about China's capacity to increase coal production. In their minds, given its abundant coal resources, China can produce as much coal as it wishes. There is large demand for coal supply in the 11th Five-Year Plan. Compared with existing coal production in China, the supply and demand increases for coal provided by each province or municipality seem quite limited; however, an aggregation of the expected increases in all localities across China is significant. Some localities propose keeping demand growing at the speed of over 10% per year within the 11th Five-Year Plan period, and this growth will depend primarily on increased coal production. Coal demand in China is projected to reach 3 billion tonnes in 2010. Not enough coal can be supplied to meet such increased demand. Current coal consumption in China has reached approximately 2 billion tonnes, accounting for nearly 40 percent of the world's total. It is an arduous task to replace it with any other kind of energy. If China had the same energy structure as a developed country, it would currently need approximately 850 million tonnes of oil and natural gas. In 2020, China would need at least 1.3 billion tonnes of oil and natual gas, 900 million tonnes must be imported. Given the present energy supply and demand and geopolitical conditions in the world, such a scenario is unimaginable.

**China's Sustainable Energy Goals**

We should build an energy conservative society and pursue a sustainable energy development strategy with a top priority being energy conservation. Such a strategy is not only proper under the actual circumstances in China, but also practical and viable for its development. China's energy issue can only be addressed from the demand side. The problem can only be solved by restricting the energy demand growth rate and total consumption to a reasonable limit.

Currently, China is endeavoring to pursue a new outlook that is based on scientific development, which would eventually lead to the realization of a completely coordinated and sustainable development system. Ultimately, this will enable China to blaze a new industrialization trail, and build a harmonious society. With a special emphasis on building an energy conservative society, the Communist Party of China (CPC) Central Committee and the State Council have made energy conservation an important part of this endeavor.

One of the important parts of building an energy conservative society is pursuing an energy development strategy focused on energy conservation. An energy saving society must be an energy conservative society. In accordance with the 16th CPC Congress's overall goal of building a better-off society in the first two decades of the 21st century, the CPC Central Committee set forth in the communiqué of the 5th Plenary Session of the 16Th CPC Congress the major social and economic development goals in the 11th Five-Year Plan period as follows: (1) double the per capital GDP in 2010 over that of 2000 by optimizing structure, increasing profit, and reducing consumption; and (2) significantly increase resource utilization efficiency and reduce energy consumption per unit GDP by 20 percent over the 11th Five-Year Plan's 5-year period. The only two quantitative objectives the CPC Central Committee set forth in the communiqué of the 5th Plenary Session of the 16Th CPC Congress regarding the 11th Five-Year Plan were these two. Judging from this, the CPC Central Committee has laid special emphasis on energy conservation and reaching reasonable energy growth rate.

To double per capital GDP from 2010 to 2000 is not to encourage hurried development at the expense of quality. Given the relatively rapid growth rate in the 10th Five-Year Plan period, the

central government is not only imposing loose requirements for the growth rates in the 11th Five-Year Plan period but also reminding all localities to not put speed over the form and content of development. To change the growth pattern and raise development quality, it is imperative to conscientiously re-adjust the hotspots of economic growth. High quality growth and development should be established on the basis of stable expansion of domestic demand. It should be achieved by strengthening commitments to education, science and technology, and social undertaking instead of relying on scale expansion.

The 20% reduction in energy consumption per unit GDP in 2010 proposed by the CPC Central Committee is also a very important objective. The current development trend in energy consumption must be reversed. If this objective is realized in the 11th Five-Year Plan period and a 20% reduction is achieved over both the 12th and 13th Five-Year Plan periods, energy consumption per unit GDP will drop approximately 50% from current levels. In this way, China can quadruple its GDP growth while only doubling energy consumption.

**Realizing These Goals**

Reducing unit GDP energy consumption by 20% is very difficult. Currently, it is unattainable since China lacks specific measures to transform development modes. To build an energy conservative society, we have to first make a fundamental change in mentality and undertake systematic readjustment in policy.

In the condition where market plays an important role in allocating resources, we can realize the goal of boosting energy efficiency. Most importantly, we need to rationalize the relationship between energy price and the environmental cost of energy resources. The value of resources in terms of land and environment in China should be fully reflected in the pricing system. Through this, we can significantly readjust the economic structure since the energy and resource price shall be under the guidance of policy.

To build an energy conservative society, we must also adjust industrial structure. We need to restrain over-development momentum in high-energy-consumption industries. We also need to make in-depth readjustments in industrial content, scale, technology, etc.

To build an energy conservative society, we also need to scrupulously consider the development trend of consumption modes in China. At present, approximately 70% of energy is consumed in industrial production processes. Therefore, people should pay attention to the issues of industrial energy conservation and industrial structure. However, the industrial structure relies on the consumption structure. It is very difficult to readjust the industrial structure if final consumption still wastes energy. Public consumption and residential consumption should also be guided to form a conservation culture and social environment embracing energy conservation.

To build an energy conservative society, it is imperative to implement specific policies. We should strengthen planning and policy guidance, and specify limits on total energy demand and energy efficiency. We shall realize the target of reducing the GDP energy consumption by 20% through specific investment projects and policies, and make energy conservation a guideline which should be included in the evaluation of government at all levels. Only with well-defined limits on minimum energy efficiency and maximum total energy demand can we carry out the research and formulation of policies favorable to energy conservation. These polices should

include financing and taxation, investment, pricing, and foreign trade polices that are formulated to promote energy conservation and efficient energy utilization. Legislating energy conservation is necessary; we should establish and improve laws, regulations, and standards relating to energy conservation. We should conscientiously implement and enforce relevant laws through careful supervision and inspection, formulate and implement mandatory standards, and push forward energy conservation in the production, buildings, and transportation fields.

To boost the public understanding of energy conservation, we need to undertake long-term propaganda campaigns and issue simple, easy-to-follow instructions. Social consensus is needed to create an energy-conservation-oriented culture. The reality in China requires us to do better than developed countries like Japan and European countries in increasing energy efficiency. Consequently, we should make a long-term commitment to improving the scientific culture and social ideas. Only in this way can we raise all citizens' consciousness of energy conservation.

In respect to energy supply, China must implement a multidirectional and diversified energy development strategy instead of relying on coal excessively and using coal to ensure China's energy supply. Now, our priority should be developing key energy resources and technologies that can enable large-scale substitution and provide modern energy services. It is of strategic importance to develop the domestic natural gas market, rapidly expand the utilization scale of natural gas, and speed up the development of hydropower and nuclear power.

In the development of nuclear power, we shall take the importance of speed into full consideration. Nuclear power accounts for nearly 20% of the world's total power generation capacity. In many countries, it accounts for 40% or even 70% to 80% of their power generation capacity. Given the construction of 50 to 60 GW green-filed power stations in China each year, nuclear power has actually been marginalized. It is important to choose a right way for the development of nuclear power technology. However, the best opportunities to develop nuclear power might be missed if China waits several years. If it waits too long, China will form a coal-dominated power generation structure. China must consider expanding the number of investors in nuclear power generation. If none of China's five major power corporations and sizable local power companies seek to improve nuclear power technology, nuclear power will become further marginalized in China.

In the 11$^{th}$ Five-Year period, numerous economic reforms will be closely associated with the energy industry. In addition to finance, investment and government restructuring, energy industry restructuring will receive extensive attention from the public. It is an important task to make energy construction more adaptable to objective needs, improve efficiency, and enhance energy security through reform measures.

# The U.S. Energy Policy Act: Content, Observations, and Lessons

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The new Energy Policy Act of 2005 represents the first comprehensive energy law adopted by the U.S. national government in more than a decade, and culminates an effort of many years to craft a consensus law covering numerous – but not all – aspects of American energy policy.

The new law is, above all, an economic stimulus package for new sources of energy supply. This package includes numerous, significant financial incentives for private investment in energy supplies and infrastructure, including new oil and gas exploration and drilling, petroleum refineries, natural gas pipelines, liquefied natural gas terminals, power lines, production of biofuels, and various forms of advanced power generation (renewables, energy efficiency, IGCC, advanced nuclear reactors).

In spite of its reported "comprehensiveness," the new law fails to address two important issues that are critical for enabling the U.S. to join other countries in addressing central energy challenges in an economical and environmentally acceptable way. The Energy Policy Act does not tighten fuel economy standards in motor vehicles. And it includes no real program to address the nation's rising greenhouse gas emissions.

These missing elements show that at present, Washington is much more comfortable addressing energy problems through carrots, even when sticks may be necessary for the U.S. to address two of its most important energy problems.

There are many factors that explain which provisions made their way into the Energy Policy Act, and which ones did not. First, major American laws come as a result of complex bargains and compromises that often reflect the accommodation of various interests necessary to pass a law, rather than the merits of the policy elements themselves. Second, in the U.S., energy policy is shaped by regional politics, organized interest groups, and the actions of countless policy makers in Washington, the fifty states, the courts, large and small consumers reacting to prices, and investors reacting to opportunities and challenges. Energy policy is shaped by such things as short-term economic conditions, OPEC, the weather, and prices in international energy markets. With some parts of the U.S. richly endowed with energy resources, and others less so, some regions see themselves as "producer" states and others view themselves as "consuming regions." These tensions play themselves out in congressional debates on national energy policy.

Increasingly, globalization trends also play an important role in U.S. energy policy. Prices for most energy products in the U.S. are shaped or at least influenced by international markets – for oil, for natural gas, for coal, and for power plant equipment. Prices for all of these things are rising, with dramatic increases in months leading up to – and following – the enactment of the Energy Act. And the environmental impacts of energy production and use in the U.S. are often felt across national borders; this is particularly true for carbon emissions from fossil fuels, since the U.S. is still the largest emitter of greenhouse gas emissions.

With this as a backdrop, the U.S. Congress – at the urging of President Bush – forged a complex new law – totaling 1725 pages of text and estimated to cost some $14.6 billion to the U.S. national budget over the next decade. The new energy Act aims primarily to stimulate new production of oil and natural gas, new infrastructure to refine and deliver those products to consumers around the country, and new advanced power- generation technologies. There are also incentives for manufacturers to produce efficient electrical appliances, and for businesses and households to purchase energy efficient equipment and to install and use systems that use renewable resources for heating, cooling and transportation fuels.

Using the familiar "carrot" of tax policy to induce private action, the Act includes various incentives for investment. There are tax provisions that allow faster depreciation of investment in gas delivery systems, electric transmission lines, and geological and geophysical costs incurred in connection with oil and gas exploration. Certain expenditures on refineries may be "expensed" rather than treated as capital investments that must be depreciated over many years. All of these have the effect of stimulating investment in energy infrastructure by reducing the effective cost to the private investor.

Other carrots for certain energy investments come in the form of tax credits. There is a "production tax credit" ("PTC") for output from new renewable power production facilities and from new advanced nuclear power plants. The renewable PTC is a two-year extension of an existing tax credit, which provides the owner of the new renewable power project 1.9 cents per kilowatthour for power produced in the first 10 years of the plant's life. The nuclear PTC is new, and operates in a similar way. New advanced coal power plants are eligible for different types of investment tax credits, such as a 20 percent investment tax credit for IGCC coal facilities producing electricity and for industrial gasification projects.

There are also tax incentives for consumers. For example, individual consumers may receive a tax credit for the purchase of fuel cell vehicles, alternative fuel vehicles, and hybrid vehicles – with the amount of the credit varying for each type of vehicle technology. Households that purchase and install residential energy efficient property (such as efficient furnaces and boilers) are eligible for tax credits on their personal income tax obligations. Similarly, businesses are eligible for credit for installing fuel cells, microturbine power plants, solar equipment, and energy efficient commercial buildings. Manufacturers that produce certain efficient consumer appliances may qualify for favorable tax credits (in addition to facing stricter efficiency requirements for 16 categories of appliances).

Apart from tax credits and other forms of favorable tax treatment, the Energy Policy Act includes a number of other incentives for investment. For example, the new law provides for the U.S. government to underwrite the risk of nuclear accidents, and the costs associated with delays in permitting of new advanced nuclear reactors. There are requirements for the use of biomass (ethanol) in motor vehicle fuel available to consumers.

The Act authorizes loan guarantees and research funds for "clean" and "innovative" power production technologies (including IGCC, advanced nuclear, biomass, and wind) that provide power with low or no greenhouse gas emissions. These forms of risk mitigation, in effect, lower the private investment costs for these sources of power. However, the funding for actual loan

guarantees and research grants will be subject to annual budget decisions in Congress, and thus is much more fragile and uncertain than are the tax incentives in the Act.

In addition to these financial incentives, there are several provisions in the new law that reduces the cost and other barriers to private energy investment: The Act authorizes an inventory of the waters of the U.S. Outer Continental Shelf to identify oil and gas resources. The new Act reduces the royalty fees paid by oil and gas companies for production within the substantial lands and off-shore waters owned by the U.S. federal government. The Act gives the federal government stronger ability to approve proposals to construct new private LNG facilities in coastal states; up until now, a state governor had the right to veto such a proposal. Finally, the Act includes a complex set of provisions relating to the electric industry, including new mandatory, enforceable reliability standards for the operation of the electric grid (which has been based on voluntary reliability rules until now).

All in all, the new Energy Policy Act is very much the package of provisions sought by President Bush. Indeed, the coalition of senators and congressmen who voted for it comes largely from the energy-rich "producer states." While it has been widely understood as a compromise, the law has been applauded by the traditional energy industry and the business community. The law has been criticized for being insufficient for non-traditional sources of energy, insufficient for addressing rising use of petroleum in motor vehicles, and insufficient for dealing with the U.S.'s emissions associated with climate change – all top priorities of the recent National Commission on Energy Policy.

It is notable that the Senate's version of the energy law included a "Sense of the Senate Resolution" (which did not make it into the final Act), which called for the next session of Congress to enact "a comprehensive and effective national program of mandatory, market-based limits on emissions of greenhouse gases that slow, stop, and reverse the growth of such emissions at a range and in a manner that (1) will not significantly harms the United States economy; and (2) will encourage comparable action by other nations that are major trading partners and key contributors to global emissions."

The U.S. finds it easier to use carrots than sticks in energy policy. These carrots take the form of tax incentives, mitigation of investment risk, and various forms of assistance for the production of energy from domestic sources. By contrast, important things did not make it into the final law, such as proposals to impose stricter fuel economy standards on cars sold in the U.S., and a cap on greenhouse gas emissions from the combustion of fossil fuels in power plants and transportation vehicles. There are various opportunities created in the Act for clean energy technologies, but their implementation will depend upon politically difficult annual national budget decisions and tenacious follow-through by federal agencies in future years. Unfortunately, these are likely to be fragile even if the nation continues to face the type of high energy prices and supply challenges faced during 2005.

# Report On The U.S. National Commission on Energy Policy

*William K. Reilly*
*Former Administrator, U.S. Environmental Protection Administration;*
*Founding Partner, Aqua International Partners*

It is a pleasure for me to participate with Chinese colleagues in a search for better energy and environmental policies. I greatly admire the priorities and commitments that China has made, and the important progress China has made in improving the efficiency of energy use. I specifically want to commend China on the recently announced communiqué by the Central Committee of the Communist Party, summarizing new goals adopted for the 11th Five-Year Plan that includes China's extraordinary aim to reduce energy use per unit of GDP by 20 percent between now and 2010.

Three years ago a group of private citizens in America came together to consider what to do about U.S. energy policy. Our country has been divided about the major issues—what to do about soaring imports of oil, whether to invest further in a new generation of nuclear power plants, whether to begin to control carbon dioxide emissions, how to reduce the carbon dioxide emissions from increasing coal consumption, and whether to adopt more stringent standards for fuel efficiency in autos and appliances.

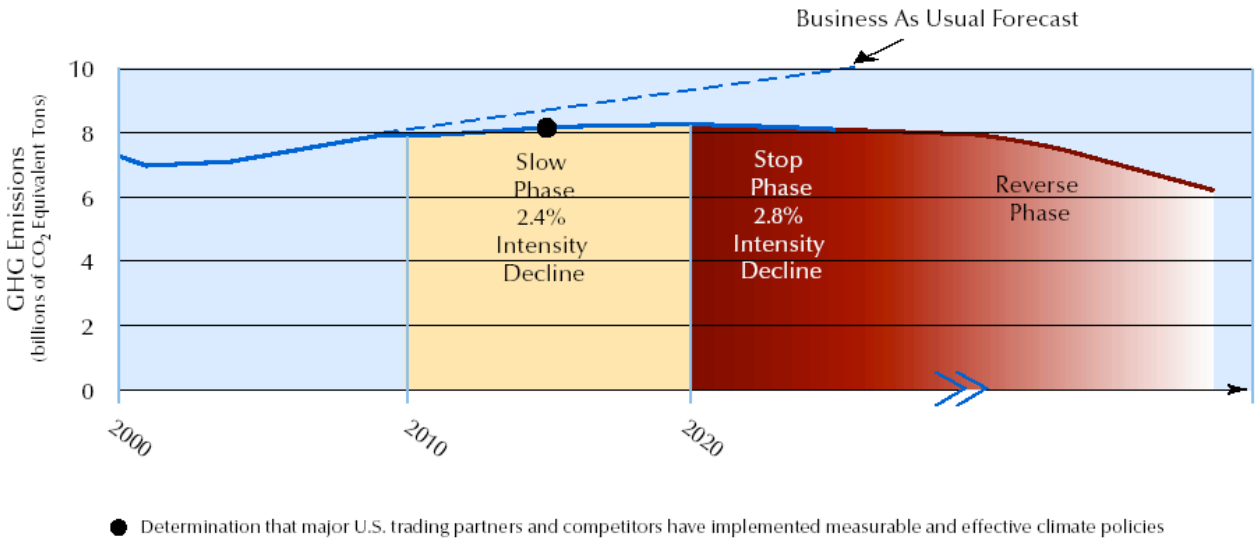
The group included prominent Democrats and Republicans, a Nobel Prize-winning scientist, a labor leader and a consumer leader, the head of a major oil company and the leader of one of the nation's largest electric power generators. I served as Co-Chairman.

The Commission's recommendations have had a significant impact on the U.S. Senate, and have changed the debate in America. I believe that the salient recommendations of the report will feature in U.S. policy debates in the future and also will be of interest to China.

The report of the National Commission on Energy Policy, released last December, offers several recommendations to put America on the course to sound energy policy. They propose ways to reduce vulnerability to disruptions of oil supply and also climate change. They support means for achieving much greater efficiency in electrical energy and the use of renewables. They advocate better vehicle fuel economy. They emphasize the need for clean-burning coal, and for additional conventional infrastructure, including liquefied natural gas and reliability of America's electrical grid, and call for greater investments in research and development to secure the new and better technologies we need.

With respect to climate change, the key elements of our proposal include:

**Commission Climate Proposal Timeline**




- Mandatory limits on U.S. greenhouse gas intensity to slow, then stop, then reverse greenhouse gas emissions in the United States. (This, by the way, is consistent with the metric adopted by the Bush Administration, and is also consistent with China's energy intensity improvement targets; more about this below.)

- A cap on costs to limit the total price of greenhouse gas reductions to the U.S. economy.

- Congressional review of the program after 5 years (in 2015) to determine its domestic impacts AND to report on whether other nations—including developing nations like China—have begun to take comparable action to reduce greenhouse gas emissions. The National Commission's plan therefore recognizes that actions from both developed and developing countries are needed.

Our proposal accommodates growth, like the Bush Administration proposal, but unlike the Bush policy is mandatory beginning in 2010.

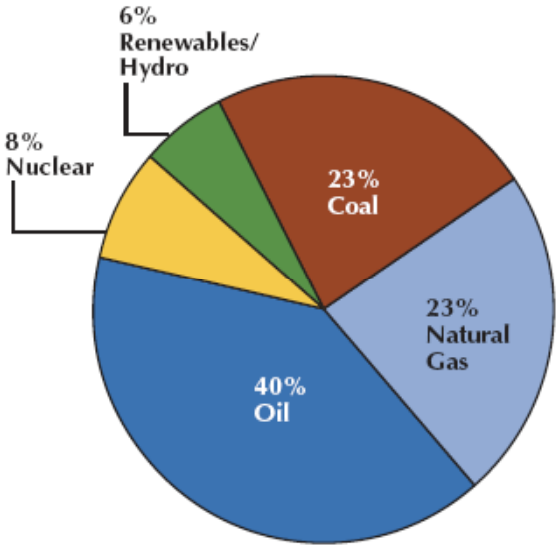
It caps costs and is not a "bet-your-economy" decision.

Like China but unlike Europe, the United States has a growing economy that will make Kyoto targets unrealistic. Kyoto would have required a 30% reduction from trend in 2010 for the United States, which is impractical and unrealistic.

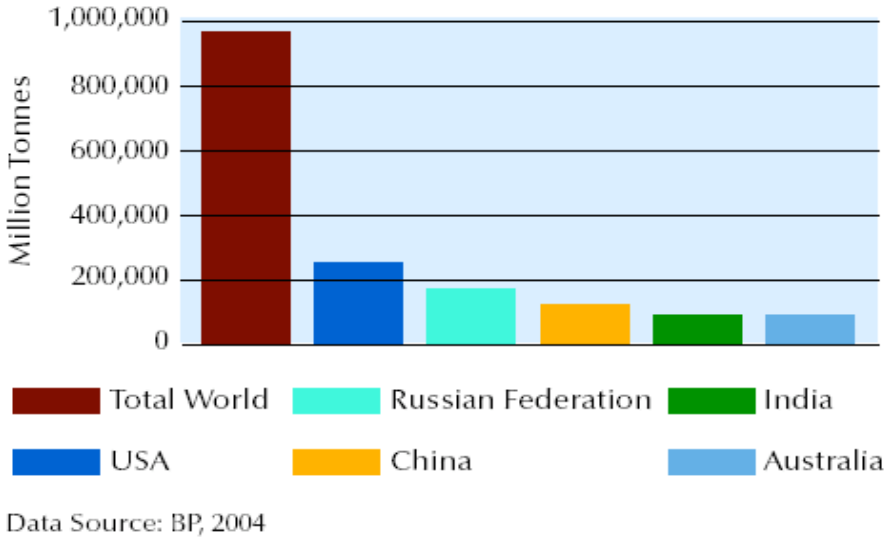
Both the United States and China will see much more coal used and this argues for accelerated efforts to capture and sequester carbon, and I am pleased that China and the United States are signatories to an agreement to cooperate on this (with Japan, Australia, and Korea). China and the United States are heavily dependent on coal for electricity: China with 20% of the world's population uses 40% of the world's coal, and is introducing 1,000 megawatts of coal-fired power per week. The United States, too, will increase its coal consumption in the next 15 years—by

16% if it follows the Commission's recommendations, and by 25% if it doesn't. Both of our countries must commit to cleaning up coal!

## Total Domestic Energy Use By Source

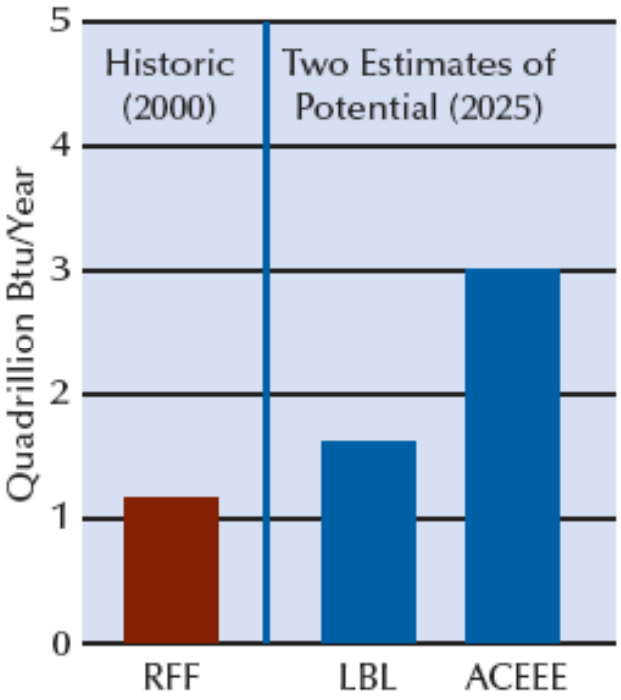



## Proved Coal Reserves

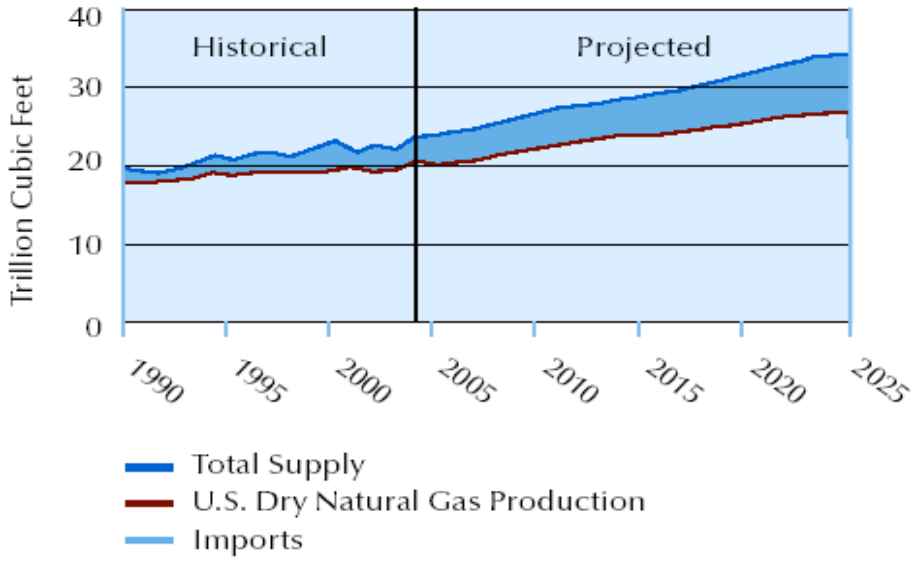



Data Source: BP, 2004

## Energy Savings from Appliance Standards

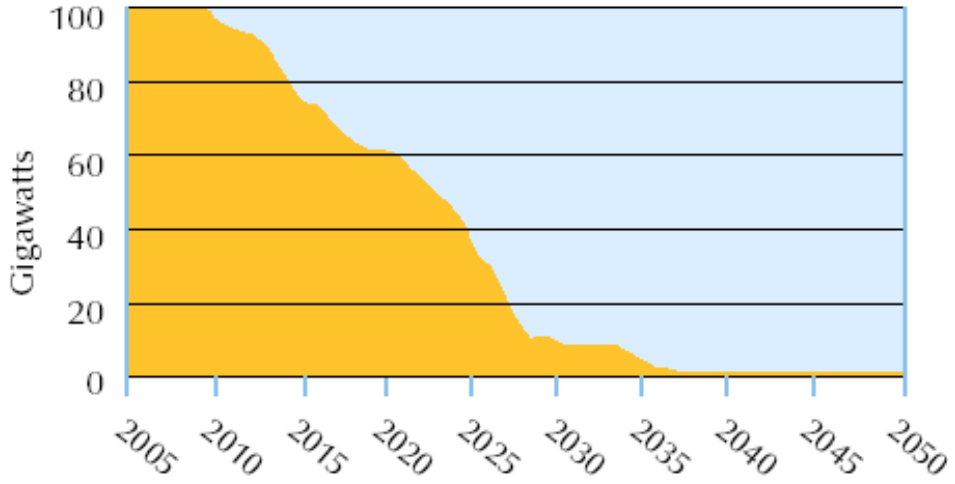



## U.S. Natural Gas Supply




Data Source: Energy Information Administration, 2004

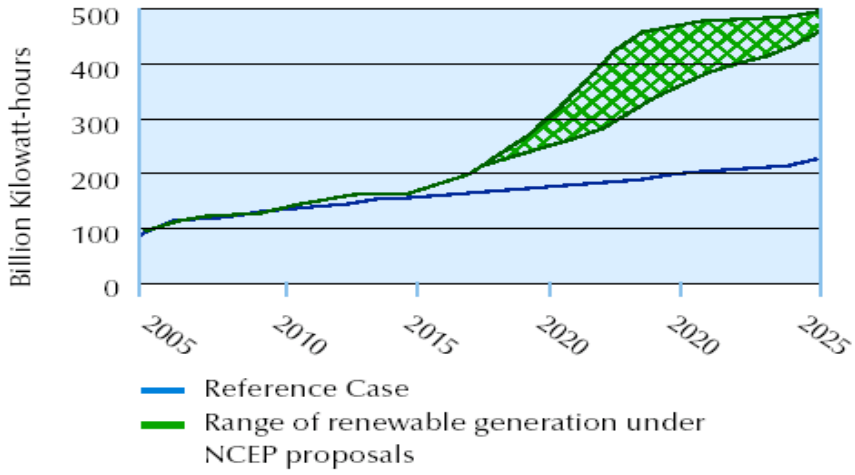
## Total U.S. Nuclear Power Plant Capacity (by License Expiration Date)




Data Source: Energy Information Administration, 2003

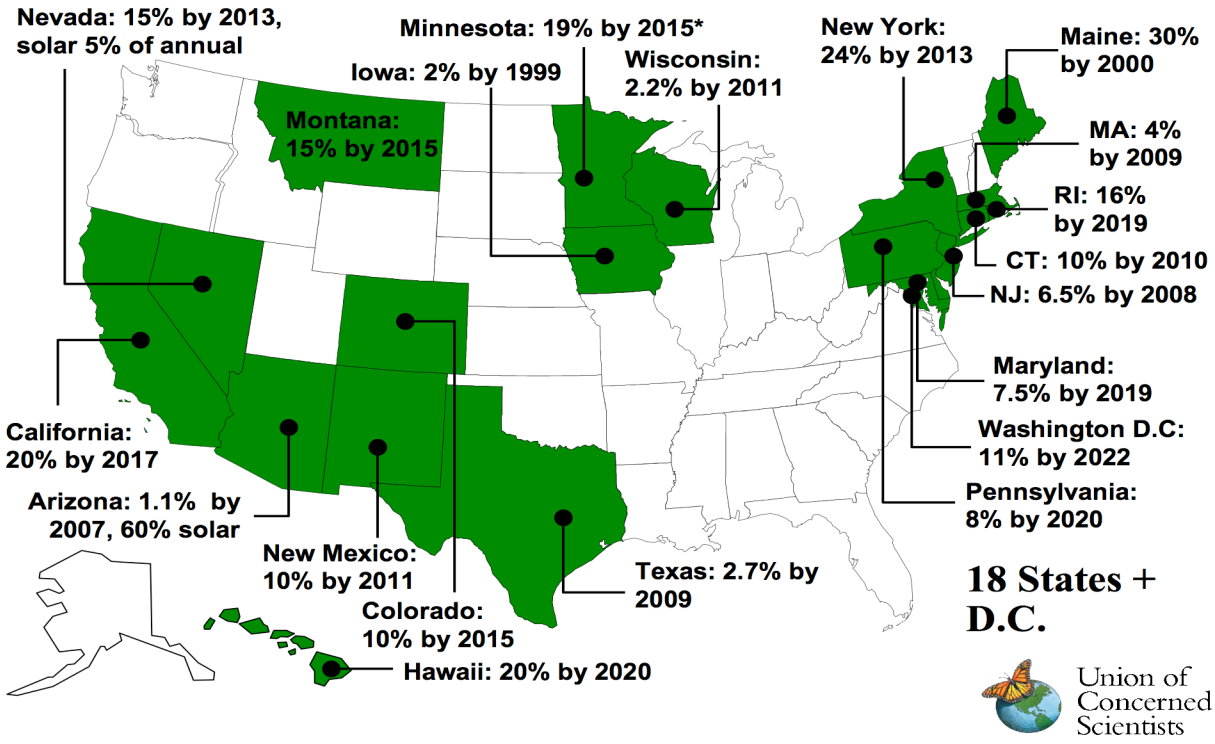
We see no way to replace the 20 percent of electrical energy now supplied by nuclear power in the United States other than by using more coal. We therefore endorse nuclear energy and believe it should play an important role in America's energy future, as I personally believe it should play in China's future supply plans for meeting electricity growth

## Projected Renewable Electricity Generation




Data Source: NCEP NEMS Modeling

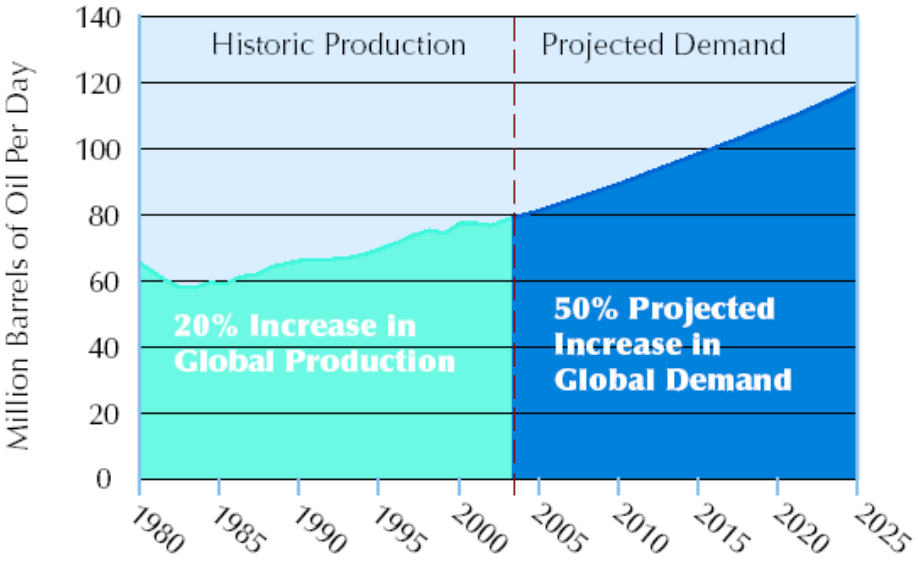
## Renewable Electricity Standards




The Commission recommendations, endorsed for the first time a mandatory regulatory system for limiting and then reducing carbon dioxide emissions. I predict that the United States will adopt mandatory controls on emissions of carbon dioxide within the next five years.

But, our Commission members, mindful of China's trade imbalance of $150 billion with the United States, made our continuation with our climate policy after 2015 dependent on China's adopting a comparable carbon-reducing program. If U.S. industry is to be carbon-constrained, our members reasoned, so too must America's major competitors, they said. Hence, just as America and China share a common interest in protecting the planet from climate change, so too we need to cooperate on carbon dioxide reduction policies to reassure our economic community.

## Trends in Global Oil Production and Future Demand




Data Source: Energy Information Administration, 2004

For both of our countries, greater energy efficiency will have large economic and competitive advantages. We have seen over the period 1980 to 2000 that China increased its gross domestic product fourfold while it increased its energy use by a factor of two, with significant improvement in energy efficiency. The United States also increased its gross domestic product much faster than it increased its energy use. Nevertheless, both of our countries are increasing their use of coal, both are increasing their use of oil, and both are now importing more and more oil and gas. The economic and environmental costs are considerable, and planetary systems are being impaired as carbon dioxide emissions grow. Both of our countries have similar interests—in continuing economic growth, in improving our energy efficiency, in limiting our imports of oil, and in protecting the environment and the planet from rising accumulations of carbon dioxide.

Thank you.

# Implementation of China's *Renewable Energy Law*

*Wu Guihui*
*Deputy Director, Energy Bureau*
*National Development and Reform Commission*

The National People's Congress passed the Renewable Energy Law (RE Law) on February 28, 2005, with President Hu Jintao signing it into law on the same day. The law will be put into practice on January 1, 2006.

The main function of the RE Law is to (1) establish an effective and guaranteed mechanism for development; (2) create a fair and stable market sufficient enough to promote technology improvement and industrial development; and (3) substantially raise cost-effectiveness. The RE Law clarifies the strategic role of renewable energy while eliminating the market barriers to renewable energy development. In addition, it establishes a guaranteed fund supporting renewable energy development, technological innovation, and industrial growth in relation to renewable energy.

The RE Law embodies the following "principles of combination":

1. Government possibilities and citizen obligation
2. Government promotion and market inducement
3. Long-term strategy and near-term demand
4. Domestic practice and international experiences

The RE Law established the following mechanisms: national gross target and planing, enforced connection to the national grid, special pricing and cost sharing, and special funds and related measures. The following bodies participated in a symposium on the coordination of associated policies, regulations and rules in order to put the RE Law into effect on April 5, 2005: National Congress Law Commission, National Congress Environment and Resource Protection Commission, Legislation Committee of Standing Committee of the National People's Congress, Law Office of the State Council, National Development and Reform Commission (NDRC), Ministry of Finance (MOF), and others. All departments recognized the importance of renewable energy and understood their responsibilities. On June 22, 2005, NDRC held a coordination meeting for preparing the associated regulations and rules by all relevant departments.

As a leadership department for the administration management on energy, NDRC undertakes most of the important responsibilities. For example, it has organized the following issues:

1. Formulating national long-term planning on renewable energy development and identifying targets for renewable energy. This planning identified tasks, guidelines and priorities under which renewable energy will be developed. Additionally, the planning identified the target for each kind of renewable energy. At this stage, the planning report has nearly been accomplished, and NDRC has asked for comments from other national and local governments. On September 9, 2005, the office of the National Energy Leading Group and NDRC held an assessment symposium on the planning report. These efforts will result in the final planning report being modified and delivered to the National Council for examination and approval.

2. Organizing a renewable energy resource survey and technology assessment, establishing the basis for a scale-up in the development of renewable energy. At the time of writing, the hydropower resource survey has been finished, and the wind energy resource survey is now being processed, while the biomass energy survey will be started in the very near future. Moreover, solar energy and ground thermal energy will be assessed, and a management system for renewable energy resources will be set up.

3. Formulating the guideline catalogue on the renewable energy industry, market permission conditions and administration of management regulations. Firstly, the guideline catalogue on the renewable energy industry will be formulated in detail based on national planning for renewable energy development. For example, the policies on investment, taxation, and market permission conditions will be outlined in the catalogue. Secondly, the catalogue will put forward formulations of standards for electricity grid-connections, and other renewable energy products, as well as management regulations on all kinds of renewable energy technologies and applications. On September 1, 2005, NDRC asked for comments from other governmental departments, provincial governments, research institutes, and big companies.

4. Formulating pricing rules on renewable energy electricity, and establishing a cost-sharing mechanism for renewable energy electricity. This policy is mainly for electricity generated from renewable energy, such as wind power, solar PV and biomass power. Firstly, price levels and pricing rules should be decided in line with what is suitable for each kind of renewable energy Secondly, the above average cost of renewable energy electricity in the whole grid should have a cost-sharing mechanism. NDRC has drafted "*Managing the Price of Electricity from Renewable Energy"* and "*Cost Spreading Rules on the Part Over the Average Price"*.

5. Formulating the Regulation on Managing Electricity from Renewable Energy. NDRC has drafted *"The Renewable Energy Electricity Generation Regulation"* and it is now in the process of asking for comments from other governmental departments. This regulation identified planning, administration permission, pricing management, grid connection and operation of the renewable electricity projects system.

6. Formulating the plan for technology innovation and industry development. Since the RE Law was drafted, the Ministry of Science and Technology (MOST) and NDRC have paid significant attention to science research, technology innovation and the development of the renewable energy industry. MOST is now formulating the "*Outline on National Long-term Science & Technology Development*," which includes renewable energy technologies. The priority for renewable energy will be large-scale wind turbines, offshore wind power technology and equipment, high performance and low cost solar PV technology, solar thermal power technology, integration of solar energy to buildings, application technology of biomass energy. NDRC has included wind power technology, solar PV technology and bio-power technology as part of special technology planning within the developing high-tech industry.

7. NDRC and MOF are now outlining the details and management mechanism for a special renewable energy fund. While NDRC has drafted "*Management Regulations on the Renewable Energy Special Fund,"* MOF will be responsible for setting up the fund.

Recently, the central government funneled significant financial support towards renewable energy, and MOF has paid much attention to renewable energy in *the 11th Five-Year Central Finance Plan*. NDRC will coordinate with MOF on this issue.

According to their respective responsibilities, several governmental bodies have laid the necessary regulatory foundation for the RE Law: Ministry of Agriculture (MOA), Ministry of Construction (MOC), Ministry of Water Resources, National Forestry Bureau, and State Environmental Protection Agency (SEPA). It is estimated that these regulations will be put into practice together with the RE Law at the end of 2005. Upon implementation, the RE Law will be both effective and provide tangible support.

# Amending China's *Energy Conservation Law*

*Zhao Jiarong*
*Director-General*
*Department of Resource Conservation and Comprehensive Utilization*
*National Development and Reform Commission*

"The Central Party's Suggestions on the Development of the 11th Five-Year National Economic and Social Development Plan," approved by The Fifth Plenary Session of the 16th Central Committee of the Communist Party of China (CPC), clearly states that "the government should elevate resource conservation to a principal national policy, encourage a circular economy, protect the environment, increase resource efficiency, establish an environmentally-friendly society, and balance economic development with population growth, resources use, and environmental protection. In order to accelerate the development of a "resource-efficient society" and realize these goals, laws need to be refined and implementation mechanisms established.

The following discusses the effects the current *Energy Conservation Law* has had on China, the necessity of amending the law, and the form such amendments should take.

## 1. Effects of implementing the *Energy Conservation Law*

In November 1997, the 28th meeting of the Eighth assembling of the National People's Congress approved the *Energy Conservation Law* (ECL), effective on January 1, 1998. This action began China's management of energy savings through the legal system. Over the past eight years, ECL has played a very important role in promoting energy saving, improving energy efficiency, and directing the national economy toward a healthier, more sustainable development track.

ECL has had the following effects:

(1) Energy-savings regulation has been improved. (a) Numerous regulations have been adopted, including "Energy-Saving Management Measures for Key Enterprises," "Electricity-Saving Management Measures," "Rules for Co-generation Development," "Rules for Residential Buildings Energy Saving," "Energy-Efficient Products Certification and Management Measures," "Energy Efficiency Labeling Management Measures," and "Rules on the Format of Energy Saving Chapters in the Feasible Report for Capital Investment Projects and its Assessment." (b) The governments of over 20 provinces have adopted a total of about 70 energy-saving regulations and measures. (c) Benchmarks for energy-saving standards, industrial energy-saving planning norms, and architectural energy-saving design standards have been developed and adopted.

(2) The energy-savings management system has been improved. This improvement can be seen in the following aspects:

1. *Energy savings management policies have been implemented.* In Hunan and Shandong provinces, the government established implementation methods to strengthen the supervision of enterprises that consume more than 5000 tce of energy each year.

2. *Mandatory energy-efficiency standards and labels have become more effective.* Twenty mandatory energy-efficiency standards for industrial equipment, home appliances, and

lighting products have been established, and energy-efficiency label pilot programs for refrigerators and room air-conditioners have been launched.

3. *An energy-efficient-products certification system has been established.* About 440 enterprises and 45 energy- or water-saving products have been certified for energy efficiency.

4. *Government procurement programs have been carried out.* The government carried out two rounds of bulk procurement, purchasing about 2000 types of products from 95 different enterprises.

(3) Substantial progress has been made toward establishing an energy-savings supervision system. Energy Saving Supervision Centers have been established in Shanghai, Gansu province, and Yunnan province based on local regulations. These Energy Saving Supervision Centers are now responsible for supervising local-government-authorized energy-saving projects, and have met some success. In Zhejiang province and Tianjin, provincial/municipal governments established special funds to support energy-savings supervision. Provincial Energy Saving Supervision Centers have developed energy saving supervision mechanisms with local governments' authorization. As a result, energy saving supervision management has been enhanced at the local level.

Since the implementation of ECL, China's energy saving management has improved. This has resulted in improved energy utilization efficiency. China's energy consumption per unit GDP in 2004 is 18 percent lower than it was in 1997. Several main products' energy consumption has been reduced. This has narrowed the gap between China's energy consumption per unit GDP and that of advanced countries.

## 2. The necessity of revising the *Energy Conservation Law*

China has realized substantial energy efficiency improvements; however, its extensive economic mode remains fundamentally unchanged. High resource consumption, excessive waste, and heavy pollution are still serious problems. Energy consumption per unit GDP is 2.4 times the world average, energy consumption of the eight most-energy-intensive industries–including the steel, nonferrous metals, electricity, and chemical industries--is more than 40% higher than levels in the advanced world, energy consumed per square foot heating buildings is two to three times the energy consumed in developed countries with similar weather conditions, and energy efficiency is 10% lower than in the advanced world. There is severe production construction, circulation, and consumption waste, and there is a huge potential for energy conservation.
Due to its staggering economic growth, China faces acute energy shortages. The prices of coal, electricity, oil, and gas are rising, and China is more dependent than ever before on imported oil. High resource consumption also brings severe environmental problems. In some areas, emissions volumes exceed environmental capacity, and energy shortage and environmental problems are impeding economic development. It is agreed that China's traditional extensive economic growth mode, characterized by high input, high consumption, high emissions, and low efficiency is no longer tenable. It is necessary to expedite the changing of China's economic growth mode, conserving energy resources.

China's 11th Five-Year period is critical to the building of a well-off society. Economic growth is restricted by many factors, but only the limited availability of resources is unchangeable and

poses the most difficult challenge. In the 5th meeting of the 16th Central Committee of the Communist Party of China the government committed to reducing energy consumption per unit GDP by 20% over the course of the 11th Five-Year period. In order to realize this goal, energy-efficiency needs to be dramatically improved. This is an important aspect of socialist modernization in China, central to the fundamental welfare of the people and long-term development of the Chinese nation.

Many energy and legal experts helped develop ECL. Its framework and design reflect the practical demands of energy conservation. The design of the system well embodies the essence of the law. But there are some obvious limitations to ECL; for instance, some of the regulations have not or cannot be implemented. ECL has been in effect for eight years. China's economy has changed much over this period. ECL is does not fit current needs in China's sustainable development and energy conservation. Improving ECL is essential.

**3. Preliminary thoughts on amending the *Energy Conservation Law***

(1) Fundamentals:

Employ a scientific outlook on development for guidance; improve energy efficiency to realize a sustainable economic and social development path; adopt stricter management systems, clarifying responsibilities for each group, improving supervision capability, enhancing systematic operation mechanisms, increasing policy incentive, and strengthening punishment and enforcement; adjust and improve ECL based lessons learned from experiences since its adoption and international best practice; and make the law guarantee energy savings is promoted into the future.

(2) Problems:

- *Government macro-control should be combined with market mechanisms.* When the government is encouraging energy saving by control, it should also consider how to utilize the market to allocate resources and motivate enterprises, companies, and individuals. A good management system, policy environment, and market environment should be created.
- *Management should be combined with incentive policies.* Strict management and supervision will limit resource waste. At the same time, pricing, tax, fiscal polices that can promote R&D of energy-efficiency technologies and the application of energy-saving products should be considered.
- *Pay attention to the control at the beginning*. The government should set a higher entrance barrier for later-comers. This will help avoid resource waste caused by wrong decision making, haphazard investment, and low technology projects
- *System design should be able to be put into operation*. For example, a strengthened elimination system should be complemented by related polices and supervision mechanisms so that regulations can be implemented without problems.
- *Enforce the law*. Those who break the law should be punished with high fines so that the law is obeyed and well implemented.

**4. Modifications to the *Energy Conservation Law***

(1) *Clearly state that energy conservation is a high national priority.* The Law should clearly state that energy conservation is an important element of China's national resource conservation policy, a long-term strategic guideline for China's economic and social development, and an

important measure to safeguard national energy security, protect the environment, increase national competitiveness, and achieve sustainable development.

(2) *Expand the scope of energy conservation.* Besides industrial energy conservation, the government should enhance energy conservation in the buildings, transportation, and public utilities sectors, organize bulk procurement of energy-efficient products, and clarify the legal responsibilities of parties involved in the implementation of the Law.

(3) *Improve energy conservation administration mechanisms.* China should expedite the approval of high-energy-conserving investment projects and market access approval for new energy-conserving projects increasing energy efficiency in energy intensive industries, the efficiency of energy intensive products, and the efficiency of new buildings. China should also improve the energy conservation management of high-energy-consuming enterprises, and improve mandatory phase-out mechanisms, energy conservation evaluation mechanisms, and public participation mechanisms of high-energy-consuming technologies, processes, equipment, and standards.

(4) *Strengthen energy conservation incentives.* We recommend the following: (a) establish a special energy conservation fund, used to support the R&D of energy-conserving technologies and government energy conservation administration; (b) formulate tax and fiscal policies that encourage the production and use of energy-efficient products, vehicles, and buildings; (c) improve the "user pays" mechanism for energy resources development and utilization; and (d) reform energy pricing to internalize energy scarcity and supply-demand relationship.

(5) *Designate an agency to responsible for executing the Law.* The vagueness of which agency should execute the *Energy Conservation Law* has been a major barrier to its implementation. The Law should be modified to clarify who is responsible for executing it, and specific the scope of that agency's authority and responsibility.

(6) *Support the extensive use of new energy conservation measures,* including demand-side management, energy auditing, contract management, and voluntary agreements.

(7) *Encourage the adoption of more stringent energy-efficiency standards and market-access mechanisms in developed regions.* We recommend local energy conservation authorities formulate implementation regulations for advanced national "reach standards."

# The Implementation of "Passenger Vehicle Fuel Consumption Limits"

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The "Passenger Vehicle Fuel Consumption Limits" standard is the first mandatory national standard regulating vehicle energy consumption in China. The standard will be implemented in two phases: the first phase limits went into effect July 1, 2005; the second phase will go into effect January 1, 2008. The fuel consumption limits will be applied to newly-certified domestically-produced and imported automobiles. The standards will be applied to vehicles in the production process and imported car models with mandatory product certification one year later.

Starting July 1, 2005, new passenger vehicles must be inspected, tested, and certified according to the "Light Vehicle Fuel Consumption Testing Methods." The testing authority will determine whether vehicles comply with the standards, and will issue fuel consumption type certification reports according to the "Passenger Vehicle Fuel Consumption Limits." When automakers submit new products for review, they must provide certain information: city/district, suburb, comprehensive fuel consumption, and $CO_2$ emission levels. Car makers, importers and testing centers should strictly follow the requirements set forth in the standard, and assume responsibility for the authenticity of car production, importation, and testing certification.

As a means of control, the National Development and Reform Commission will distribute information about car models failing to meet the fuel-economy standards in public bulletins. The new policy will be applied to newly-certified car models (including imported ones) starting in July 2005. The standard, however, will be applied to vehicles in the production process and imported car models with mandatory product certification starting in January 2006. The relevant fuel consumption data and testing reports will be handled and summarized by organizations designated by the National Development and Reform Commission.

While demonstrating such cars for sale, car makers and importers must display fuel consumption data and other relevant information on a label attached to the vehicles, in accordance with the "Light Vehicle Fuel Consumption Testing Methods," which went into effect July 1, 2005.

To meet special consumer demands and manage the automotive energy conservation more effectively, the passenger vehicles that do not meet the standard will be subject to an extra consumption tax. Such vehicles can be produced or imported and sold only after these extra taxes are paid. The relevant requirements and regulations of consumption tax will be formulated by the Ministry of Finance and the State Administration of Taxation in consultation with the National Development and Reform Commission.

At present, the National Technical Committee of Automotive Standardization (NTCAS) is formulating a standard for light-duty commercial vehicles, the "Light Commercial Vehicle Fuel Consumption Limits" standard. NTCAS has completed a survey and analysis of fuel consumption data, and is beginning technical and economic analysis. The preliminary research on "Light Vehicle Fuel Consumption Labels" standard is nearly finished, and a working group is being arranged. Once these two mandatory national standards and public disclosure systems are

in place, China will have established a comprehensive administrative system for vehicle energy conservation.

# Challenges Facing Project Implementation at the Provincial and Local Levels

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This paper will first review some projects undertaken in Shanghai with Energy Foundation support in recent year and then analyze challenges facing the implementation of several projects at the provincial and local level.

Review of Energy Foundation projects in Shanghai

In recent years, with the support of the Energy Foundation, several universities and research institutions in Shanghai have conducted research projects on energy and environmental protection. This research has promoted energy conservation and sustainable development in Shanghai. The results have already been incorporated into energy standards and Shanghai's *Eleventh Five-Year Energy Plan*; they are also influencing the shape of Shanghai's *Energy Conservation Plan*. The Energy Foundation has done much to support Shanghai over the past several years.

Energy Foundation-supported policy research in Shanghai can be grouped into the following four areas.

**1. Formulating a long-term energy strategy and policy framework for Shanghai.**

Improving energy efficiency, accelerating clean energy substitution, and taking a low-carbon development road is the logical choice for Shanghai's long-term energy strategy. Projects have analyzed and quantified health benefit of low-carbon development utilizing terminal control measures. Based on Shanghai's economy-energy-environment-health priority chain and learning from California's experiences, Energy Foundation-supported projects have recommended the following low carbon development measures be taken in Shanghai: (1) develop energy conservation, improve energy efficiency, and reduce emissions; (2) utilizing gas and electricity from Western China and transitioning to a low-carbon development path; (3) develop and promote the use of renewable energy; and (4) establish strategic reserves for low-carbon energy to ensure low-carbon economic development.

These research findings have received significant attention and many have been adopted. One significant result was the implementation of a green electricity pricing mechanism. On the first day of *The 2005 National Energy Conservation Publicity Week*, Shanghai formally launched its green pricing program when 15 parties—including Shanghai Baosteel, Shanghai Tobacco Group, and the Minhang District Government—entered an agreement with power utilities to voluntarily purchase of green electricity. Shanghai thus became the first city in China--the first city in a developing country—to implement green electricity pricing. This voluntary purchase of green electricity helps cover the cost difference between renewable energy and conventionally-generated energy, thereby supporting the development of renewable energy power generation. More importantly, voluntary green power purchase helps raise public awareness of environmental protection and the green power concept, promote social responsibility,

and establish a social climate in which everybody helps improve the environment by supporting green power.

**2. Carrying out power demand side management (DSM) and establishing long-term electricity conservation mechanisms.**
Relieving peak power load by increasing investment in peak regulating generating units is uneconomical because it is not fully utilized; DSM, on the other hand, could relieve such peak load at a lower cost, while easing power supply shortages, improving economic performance in the power sector, and minimizing the damage ot the environment resulting from building new power sources.

Behavioral, technical, economic, and administrative aspects of DSM implementation in Shanghai have been researched, laying the groundwork for the establishment of long-term electricity-saving mechanisms. Research results have been included in Shanghai's *Eleventh Five-Year Energy Plan* and *Energy Conservation Plan*. Our current mission is to (1) set tougher mandatory energy efficiency standards for home air conditioners and (2) make new breakthroughs under the existing system of energy conservation standards and law systems.

**3. Formulating building energy efficiency standards and improving building energy conservation.**
Shanghai has made great progress by setting a 50% energy conservation standard for residential and public buildings. Currently, the 50% energy conservation standard for residential building has been fully and strictly implemented, while the 50% energy conservation standard for public buildings, also being implemented, mainly targets government-funded construction and the World Expo Park Project. Energy Foundation-funded research projects have provided a foundation for the enforcement of building energy-efficiency standards, making it possible to achieve the goal of 50% energy conservation.

Energy Foundation-supported research projects have also analyzed barriers to the development of combined heat and power generation (CHP) in Shanghai and have recommended policies to help Shanghai overcome these barriers. This research indicates that distributed CHP systems for buildings are economically competitive. Now, it is imperative to formulate unified, transparent, and feasible standards and specifications for power grid connection and fuel gas fire control safety measures. Market-driven mechanisms should be used to increase investment in and financing for combined heat and power generation (CHP), and energy companies should be encouraged to install CHP facilities.

With the research results in mind, five government departments, including the Shanghai Municipal Development and Reform Commission and Shanghai Municipal Economic Commission, jointly issued a document in September 2004 to stimulate the installation of distributed energy supply systems in factories, hotels, large department stores, and commercial buildings. Moreover, the government enacted preferential policies that offer a subsidy of 700 RMB/KW of installed capacity of distributed energy supply systems, allow for seasonal price changes in natural gas for distributed energy supply systems, offer tax reduction incentives for equipment imported for distributed energy supply systems, and support distributed energy supply systems' connection to

the power grid. Also, in August 2005, the first *Distributed Energy Supply System Technical Specifications* were implemented in Shanghai. These developments show that Shanghai is eager to further the use of distributed energy supply systems, optimize its energy supply structure, and thus construct a diversified and secure energy supply system.

**4. Developing technical policies for rapid transit systems and advanced- technology vehicles**

Established rapid transit systems is one of the most economical and effective ways to alleviate traffic congestion in Shanghai. Hybrid cars should also a part of strategic sustainable energy development. Research has indicated that with the exception of motorbikes, no restrictions should be put on two-wheel vehicles. Hybrid two-wheel vehicles offer another means of "green" transportation, and could be important for Shanghai's green development. Areas for bicycles and walking should be encouraged and protected. Some of these transportation findings have also been incorporated into Shanghai's *Eleventh Five-Year Energy Plan* and *Energy Conservation Plan*. Also, the Chaoyue hybrid car, developed in Shanghai, is already in its third series, well on the way future production.

Energy Foundation-sponsored research on sustainable energy and environmental protection policies in Shanghai effectively apply a scientific framework to develop and construct an energy-saving society. We sincerely hope that the Energy Foundation will continue its support of Shanghai.

Challenges facing project implementation at the local level

While many projects have yielded significant results, there are still some challenges at the local level transforming research results into policies. We will discuss four problem areas in the balance of this paper.

**1. Localities are subject to the constraints of current national administrative specifications when formulating forward-thinking energy-efficiency regulations and standards.**

Under China's current legal framework, the central government does not grant local governments the power to formulate energy conservation regulations that are stricter than national administrative specifications. Once the relevant central government department issues relevant technical standards, localities are constrained if they want to make any breakthroughs. .

On March 1 of this year, the national standard *Energy Efficiency Limiting Values and Energy Efficiency Class for Room Air Conditioners* went into effect. The standard classified room air conditions into 5 classes based on energy efficiency and stipulated that the 5th class marks the market access threshold. (Taking the frequently used 1p and 1.5 p detached room air conditioner as an example, the energy efficiency ratio of the 5th class is only 2.6, while that of the 1st class is 3.4.) The standard also stipulates that the market access threshold will only be raised to the 2nd class, which has an energy efficiency ratio of 3.2, by 2009. Although the standard gives consideration to the different levels of social and economic development in different localities, it does not reflect the different needs of different regions.

As an economically advanced mega-city, Shanghai is now building a "saving" city. It needs to take the lead in raising the market access threshold for room air conditioners to raise the energy efficiency of home appliances to enter the Shanghai market. International experience, e.g., the case of California in the United States, shows that energy efficiency levels in the country as a whole would rise if several developed regions take the lead in implementing forward-thinking energy-efficiency standards.

It is technically and economically feasible for Shanghai raise the market access threshold for room air conditioners from 5th Class to 2nd Class, without posing any technical problems for mainstream air conditioner factories in China. There are great economic and social benefits to be realized by doing so: the cost of reducing an air conditioner's power use by 1 KW is less than 2,000 RMB, far less than the average cost of installing new power capacity, 5,000 RMB/KW. Consumers will also benefit economically: assuming an air conditioner is used 700 hours annually, consumer electricity bill savings will cover the additional purchase cost in less than three years.

With support from the Energy Foundation, Shanghai has conducted a considerable amount of research into the implementation of prescient energy standards; however, it needs support from the government to take the lead in China in implementing standards, such as the one for room air conditioners, ahead of national schedule. If is is able to do so, Shanghai could make energy efficiency breakthroughs in China.

**2. Implementing power DSM needs the support of fiscal polices.**
Demand-side management describes the use of highly energy-efficient terminal equipment and devices, which raise end-users' energy efficiency, optimize power usage, and reduce power demand. With funding from the Energy Foundation, Shanghai has already completed feasibility studies on power DSM. The main power DSM task for Shanghai is to build energy-efficient power plants (EPP).

An EPP is a bundled set of DSM programs designed to deliver the energy and capacity equivalent of a large conventional power plant. Shanghai has developed two schemes to implement an EPP. If scheme 1 were implemented with support from policies, regulations, and funding, power usage would be reduced by 2 million KW and 10 billion KWh of electricity would be saved by 2010. Over the course of the equipment's lifecycle, 50 billion KWh of electricity can be saved. Seven billion RMB would be needed to fund scheme 1; the cost of investment in the EPP would be about 3,500 rmb/KW, 1/3 the cost of installing a traditional power plants with electricity transmission and distribution systems.

Scheme 2 is more limited and easier to implement. Scheme 2 requires key support be given to some easy-to-manage projects, which yield fast results. If scheme were implemented, power usage would be reduced by over 1 million KW and 6 billion KWh of electricity would be saved within 5 years. Over the course of the equipment's lifecycle, 30 billion KWh of electricity would be saved. This scheme requires a total investment of 3.5 billion RMB.

DSM energy efficiency projects first need financial support from the government. These funds need to come from the electric power premium (as known as the electricity price

utility charge). Currently, the right to examine and approve electricity prices still rests with the government and electricity prices are strictly controlled by the government. Therefore, there is an urgent need for the government to introduce specific administrative measures for electricity and utility charges and administrative measures for the use of DSM subsidy funds so that localities can start DSM energy efficiency projects as early as possible.

**3. More incentives, unified evaluation methods, and tools need to be introduced for enterprises to enter voluntary energy efficiency agreements.**
Voluntary agreements are a new method that has used effectively abroad to induce industrial enterprises (particularly large enterprises) to increase energy efficiency and reduce emissions. It has been used in many countries and yielded very good results. Voluntary agreements have several notable advantages in overcoming obstacles to energy conservation.

Funded by the Energy Foundation, the China Energy Conservation Association conducted a pilot voluntary energy efficiency agreement (EEA) program in 2000 in which Laiwu Steel and Jinan Steel in Shandong Province entered a voluntary agreement with the local government. The Shanghai Municipal Energy Conservation Supervision Center began research work last year on using an EEA in Shanghai. The Center is currently working on *Research on Energy Efficiency Benchmarks for Industrial Enterprises in Shanghai*, which is mainly concerned with setting energy-efficiency benchmarks and benchmark indices for the iron and steel, chemical, and power generation industries. Shanghai's first voluntary agreement, an agreement between the Shanghai Municipal Economic Commission and Baosteel Group, is also expected to be signed by the end of this year.

Shanghai faces two main problems in its work on EEAs: (1) there is a lack of supplementary policies and long-term effective mechanisms that encourage enterprises to enter EEAs and (2) there is a lack of benchmarks and methods for systematically evaluating enterprises' energy efficiency. To address these shortcomings, we suggest that the government expedite the formulation of a set of incentive measures and subsidies, a pollutant discharge trading system, tax reduction and exemption policies, and project examination and approval methods to facilitate enterprises' entering EAAs. In addition, we suggest the government organize research on energy efficiency benchmarks and guidelines and tools for evaluating enterprises' energy efficiency so as to scientifically and rationally create and evaluate enterprises' progress in meeting EEAs.

**4. Strengthening energy conservation law enforcement requires further improvement of existing energy conservation laws and regulations.**
After the *Energy Conservation Law* went into effect, Shanghai formulated and implemented local energy conservation regulations. In 1998, it started energy conservation supervision work. Over the years, Shanghai has had notable results in energy conservation supervision in the areas of fixed assets investment, energy use, and energy supply quality.

Recently, the Central Committee of the Communist Party of China urged the building of a resource-saving and environment-friendly society, and called energy consumption

per unit GDP to be reduced by 20% during the Eleventh Five-Year period. To answer this call, Shanghai needs to strengthen its energy conservation supervision. This requires the revision of China's *Energy Conservation Law* and Shanghai's *Energy Conservation Regulations* to provide increased legal backing for energy conservation law enforcement.

Shanghai has been examining the results of, problems with, and way to further improve the implementation of energy conservation laws and regulations. Shanghai currently faces the following challenges in energy conservation law enforcement: (1) legal resources are inadequate, clauses are too general and cannot be effectively implemented, and punishments are too soft; (2) the energy conservation law enforcement entity is not clearly specified and there is a lack of communication between law enforcement agency as well as a lack of enforcement power; (3) parties involved in energy conservation law enforcement and management need to further coordinate their relationships and cooperate more with one another; and (4) energy conservation law enforcement capacity needs to be further strengthened.

# Addressing Industrial Energy Efficiency – The UK Experience

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## The UK Climate Change Programme

1. The UK has a commitment under the Kyoto protocol to reduce greenhouse gas emissions from their 1990 level by 12.5% by 2012. The UK has also set itself a goal of reducing CO2 emissions from 1990 levels by 20% by 2010. The UK Climate Change Programme (CCP) sets out the programs and policies to meet these targets. It was established in 2000 and is currently under review.

2. Energy efficiency plays a large role in the CCP. In addition to helping combat climate change, energy efficiency is central to sustainable development since it reduces dependency on natural resources, reduces industrial costs and helps the poor to afford adequate heating.

3. UK emissions were 156Mt Carbon in 2003. Industry and business contributed 40% of these emissions. There have been large improvements in energy efficiency over the last thirty years, realising about 1.4% per annum over the decade 1990 to 2000. However, this rate needs to double to meet commitments. The UK aims to cut emissions by 12.1 Mt Carbon, which equates to 7.7% of the total. Industry and business will need to contribute 7.4Mt of this 12.1Mt.

## Climate Change Levy Package

4. The constituents of the Climate Change Levy Package are:
   - The Climate Change Levy (CCL)
   - Climate Change Agreements (CCAs)
   - The Carbon Trust
   - Enhanced Capital Allowances (ECAs)

   In addition, the UK has a domestic Emission Trading Scheme and is now also participating in the EU Emissions Trading Scheme.

5. The CCL was introduced in 2001. It applies to most[2] fuel use by all non-domestic activities[3]. To encourage co-generation and the use of renewable sources of energy, these are not taxed. It adds about 10% to fuel bills at current energy prices. Most companies could save the cost of levy by simple and basic energy efficiency measures with low or no cost, i.e. good energy management. However, typically, the costs of energy are such a low proportion of the total business costs (around 1% or less) that the levy has not had a

[2] Fuel oil is not taxed because it has a separate duty regime
[3] Except very small business use and charities

large impact on non-energy intensive businesses. The UK is currently looking at other ways of targeting this type of business, e.g. retail and office services.

6. However, the combination of the CCL and voluntary agreements in the CCAs has proved very effective in targeting industry that **is** energy intensive. Such industrial sectors are open to international competition, and so the UK government recognized that these businesses could be harmed if they paid the full rates of the levy. In return for lowering the rates by 80%, industry was invited to enter into binding agreements to improve energy efficiency by meeting quantified targets over a ten-year period. This period was considered necessary to allow industry to plan its investment programs. However, experience has shown that substantial savings were available in a much shorter period.

7. The CCL was designed to be "revenue neutral". Most western governments prefer environmental taxes not to be seen as a way of raising revenue, but as a genuine attempt to change behaviour to tackle environmental problems. The revenue raised is therefore usually "recycled" to industry in one form or another. A common way of using it is to reduce other taxes, especially taxes on employment, and using the revenue to promote the desired behaviour change. In the UK, the full rate of levy would have raised £1b per year. This was used

    - to reduce employment taxes,
    - to give tax concessions for purchase of energy efficiency equipment (Enhanced Capital Allowances),
    - to fund the reduced rates of tax obtained through the agreements and the exemptions for cogeneration and renewable energy sources, and
    - to fund the Carbon Trust.

8. The Carbon Trust is a type of public benefit fund. It is run at arms length from government and it promotes carbon reductions in industry, business and the public sector. It has taken over the government's energy efficiency best practice program, it provides advice and audits, low cost loans for energy efficiency projects, and venture capital for early stage carbon reduction technologies. It has provided a very effective support service for companies in CCAs as well the wider economy and public sector.

Climate Change Agreements

9. These are energy efficiency agreements whereby participating companies can obtain an 80% reduction in the CCL if they meet challenging targets over a ten-year period from 2001 to 2011. The agreed targets were originally forecasted to save 2.5Mt Carbon a year by 2010. This was ten times the estimated savings if they had paid the full rate of levy. So something was clearly happening to traditional economic theory. It would not be expected that paying 100% of a tax would generate, through the price signal, only 0.25MtC, but by giving back 80% of this tax, 2.5MtC would be achieved.

10. The reality is even better. In the first four years of the scheme, these sectors have outperformed even the targets. In 2002, they achieved a carbon reduction of 4.4 Mt, against a target of 1.6 Mt, and in 2004, they achieved 3.9 Mt, against a target of 1.5 Mt.

11. We can only guess why this happened, but it does seem that psychology is at work rather than economics. The CCA were not a simple response to a price signal. To get **their** money back from the government, companies **had** to take action and to report their results. These companies are now collectively saving themselves over £450m a year on their energy bills (in addition to the CCL reduction). These are the same companies who had not responded to 25 years of energy efficiency advice and campaigns.

12. The crucial element is the link between the levy and the agreements. The CCA were not simply a price signal but ensured action was taken. Finance Directors started to take interest and authorised energy efficiency action. When industry examined its actual energy use, it found energy savings were much easier than expected.

## Implementation

13. It took the UK government around three years to design and implement the levy and CCAs. In March 1998, the government asked Lord Marshall to examine the feasibility of controlling industrial CO2 emissions through a trading scheme. His report, in November 1998, recommended a trading scheme be established, at least in part to train UK industry for wider international schemes. But he also recommended that trading would be suitable only for larger companies. So that all would contribute to emission reductions, he also recommended a basic tax, but at lower rates for energy intensive industry. The UK government decided to ensure that energy savings were obtained in return for energy intensive industry paying a lower rate, and the Climate Change Agreements resulted.

14. The UK government announced in March 1999 that the levy and agreements would start in April 2001. Negotiations began with industry on the terms of the agreements and on the targets to be adopted. The targets were generally agreed as a percentage improvement on energy efficiency at sector level. The sector associations decided how to divide the targets between their members. Between December 2000 and March 2001, agreements were signed with 40 sectors and 6000 companies, covering 12,000 sites.

15. The issues that took the greatest amount of time were not in fact the target negotiations, but the terms of the agreements on how the government would determine whether targets had been met, and what concessions could be offered. The UK now has considerable experience in the operation of the agreements, what worked, and what we would do differently. It would be possible to streamline the processes and simplify the agreements.

16. There must be measurable numerical targets and a real risk of losing the discount to incentivize real action. But this is not a burden on industry. Energy use must be measured and monitored if it is to be properly managed. This would be true without any government incentives for efficiency.

**UK Emissions Trading Scheme**

17. The availability of trading is essential to the operation of the CCAs. There may be many different reasons why a target is missed, but trading allows companies to meet the targets from someone else's reductions. It helps companies to retain the discount and therefore protect their competitiveness. The UK government has introduced simplified verification processes for smaller companies so that they can more easily make use of the trading mechanisms.

## Conclusion

18. The levy and voluntary agreements have proved to be a powerful combination in achieving energy efficiency improvements in energy intensive industry. The levies send price signals to the general economy, but are not high enough to damage profitability. Most businesses can offset the effects of the levy by simple energy efficiency measures at low or no cost. However, substantial improvements in energy efficiency in energy intensive sectors would not have been possible with the threat of the levy at full rate if these sectors did not meet targets. The combination of levy and agreements is therefore crucial to the operation of this program. The levy can also fund the provision of energy efficiency advice, which supports the package. Above all, the program saves industry substantial amounts of money on their energy bills as well as reducing green house gas emissions. All parties gain.

# Energy and Environmental Tax Models from Europe and Their Link to Other Instruments for Sustainability: Policy Evaluation and Dynamics of Regional Integration

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## Executive Summary

Many countries supporting Agenda 21, including the European Union and its Member States, have recognized that action for improving the environment is necessary. The EU has committed itself to binding greenhouse gas (GHG) emission reduction targets under the Kyoto Protocol, encourages and obliges its Member States to implement effective policies, and monitors their progress.

Energy systems need to change for many reasons: the requirement of more energy services due to economic growth, limited access to modern forms of energy, concerns over the security of supply, and important environmental issues, including air pollution, acidification, and climate change. These reasons are further related to issues of peace, poverty alleviation, and geopolitical stability. The main strategies are to improve energy efficiency, increase the use of renewables, the introduction of new technologies, and policies mitigating climate change.

Since the early 1970s, and as reflected at the 1992 Earth Summit, sustainability and respect for the environment in the context of development have become global political goals, marked by the following international agreements: Agenda 21, the Rio Declaration on Environment and Development, the Statement of Forest Principles, the United Nations Framework Convention on Climate Change, and the United Nations Convention on Biological Diversity. The Agenda 21 plan of action is especially seen as a "global consensus on the road map towards sustainable development".[4] The World Summit on Sustainable Development (WSSD) in 2002 underlined the importance of energy for development and the urgency for sustainable development worldwide.

China is committed to Agenda 21, and was the first nation to adopt a national Agenda 21. Cleaner, energy efficient production of goods and services is one of China's key strategies for sustainable development, recently documented by the entry in 2003 of the Cleaner Production Promotion Law[5]. Article 7 of this law stipulates the way towards introduction of ecological taxation:

*"The State Council shall formulate fiscal and tax policies conducive to the implementation of cleaner production. The State Council and other relevant administrative departments having corresponding responsibility and the people's governments of provinces, autonomous regions*

[4] Global Environmental Outlook 1, United Nations Environment Programme, Global State of the Environment Report 1997, Introduction

[5] Approved by the Standing Committee of the National People's Congress (NPC) of the People's Republic of China in the 28th Session on June 29, 2002, entered into force on First of January 2003

*and municipalities directly under the central government shall formulate and implement beneficial industrial development policies and technological development and popularization policies and undertake supervision and management measures conducive to the implementation of cleaner production."*

The European Union, and many of its Member States, have gained experience in the use of tax and fiscal policy tools to pursue environmental goals. Some of the policies and experience gained in Europe may be relevant for China's own progression towards sustainable development. However, not all tools or their application have had sufficient results.

The introduction of tax instruments is integral for sustainable development. Ecological taxation normally means a shift in the tax philosophy of the respective country, applying a cost reflecting the environmental impact of a products entire life cycle through production, use, and waste. "Don't tax goods, tax bads" is the general slogan or motivation for such Ecological Tax Reforms (ETRs), or Ecological Fiscal Reforms (EFrs).

The increased use of green taxation has shown positive results in some countries through a shift from labour taxation towards pollution or resource-use taxation. Improved environmental indicators clearly underline the necessity to adopt this instrument in the future.

In the EU, energy and carbon taxation is seen as part of a country or industry's sustainable management. This management requires a variety of different tools from strict legislation to voluntary agreements. Depending on the method and stage of development, each country's priority for certain tools may vary. Overall, one binding element is a master energy and emission reduction plan, setting clear and binding targets with enforceable deadlines. The thoughtful combination of tools, and development of a balanced program can generate the most significant effect.

This paper reflects on the most important instruments used to date in Europe, especially energy taxation, and puts these efforts into perspective with other measures such as emission trading and voluntary agreements. It provides examples from selected Member States on energy taxation and their effectiveness, and outlines the strengths and weaknesses in combining different mechanisms.

Modern, flexible, and sustainability-driven policy works best with green taxation, and especially energy or carbon taxation. However, it is evident that tax models are just one important tool in a necessary range of policy instruments. Sound environmental policy requires state responsibility to enforce strict rules. These rules provide the basis for supportive measures and incentives such as eco-taxes and voluntary agreements.

Specifically, voluntary agreements and emission trading can be effectively coordinated with energy taxes. A combination of input taxes for fossil fuels and uranium, electricity taxes for end-users and careful tax rebates for industrial installations taking part in emissions trading has proven to be a productive solution.

It is important that the overall tax system is balanced in a way that shifts towards green taxation. Energy taxation is necessary to achieve climate mitigation and CO2 reduction. The tax system needs to integrate effects on the overall electricity market, including the taxation of nuclear

technologies despite the fact that they do not add substantially to CO2 emission levels. In the United Kingdom, a specific supplementary "primary energy tax on nuclear fuels" was designed in conjunction with the Climate Change Levy in order to balance the market effects.

Green taxation can lead to technological modernization and a shift in consumer behaviour. Green taxation can be applied on different levels, from local to international. Energy taxation is mostly a nationwide instrument, sometimes supranational in Europe.

Harmonization of energy taxes became necessary at the European level in order to ease competition and to decrease levels of exemption for energy-intensive industry and other participants in the economic process.

In view of the respective targets, especially the CO2 emission reduction target, the tax instruments must be designed carefully and their effect on the environment must be monitored.

In general, exemption from energy taxation for specific sectors such as energy-intensive industries represents state aid in the European Treaties' definition and must be notified to the European Commission by the Member State and evaluated by the Commission according to EC State Aid Rules. The European Commission works with a set of evaluation criteria for the acceptance of state aid in the context of energy and overall environmental taxation. These published guidelines are regularly reviewed and updated.

Subsidies and the eco-tax mechanisms require the implementation of controls and surveys by an independent authority. This is necessary to increase knowledge and experience with green taxation mechanisms, including economic knowledge of the costs of not internalizing externalities.

Energy consumption in the majority of EU Member States is still rising, requiring continued attention to policy matters. These include improving energy efficiency, increasing the use of renewables in electricity, the transport and heating/cooling sector, and the encouragement of energy services.

Overall, the following lessons can be drawn from the European experience:

- Ecological taxation needs clear programming with specific environmental targets, such as monitored GHG reduction targets over a specific time period.

- The first step towards the introduction of ecological taxation is a clear design of the overall tax scheme. Planning for eco-taxation needs to be integrated into the overall fiscal development plan of a government and into ecological measures and instruments. National Sustainable Development Strategies are important to help define on which level of administration each type of taxation is appropriate. Often, the local level is best suited to execute plans decreasing pollution and minimizing waste, and to issue regulations that generate income to pay for clean-up, insure polluters take responsibility for charges, and maintain a sustainable lifestyle for local communities. The role of the central governmental level is to monitor the beneficial execution and enforcement of the tax income and to control expenditure for this specific tax revenue.

- Emission limits have to be legally defined with clear consequences for compliance failures. Ecological state governance is to be introduced, meaning an administration which cares for sustainable governance capability in combining corporate and political governance under well defined sustainability priorities.

- All exemptions from taxation must be referred to an independent agency for approval. The exemption can only be given with a review clause and should be limited and decreasing over time.

- The structure and level of the tax scheme is important, and its compatibility with other environmental measures is crucial. Too generous exemptions undermine achievement of the objectives and become counterproductive to the very environmental aim the tax was designed for.

- The tax system must, as all tax systems in democratic structures, avoid undue burdens on the individual citizen. The law must be transparent and easy to understand, meaning that the basic principles of clear tax schemes such as generality, equivalence and ability must be met.

- Harmonization of energy taxation helps to avert competition issues regarding distortion in the market place. The introduction of a harmonized energy tax in Europe will increasingly phase out concerns over competition. More challenging reduction targets for GHG emissions attached to the EU tax level will certainly increase the effectiveness and efficiency of the tax scheme.

- The use of revenues can play an important role in reinforcing the incentive signals which the levy is intended to convey.

- A careful negotiation with main stakeholders before introduction of the tax scheme and a persistent information campaign to the public is crucial to success.

# China Sustainable Energy Program
# Buildings Program Strategy

***Overarching goal: Increase building energy efficiency through the use of appliance energy-efficiency standards and building energy codes.***

**Goal #1: Increase the energy efficiency of household appliances and equipment by using energy-efficiency standards and energy labels.**

Means:
We can achieve this goal by helping China do the following.

1. Train government research institutes and other parties involved in energy-efficiency policy development and implementation in appliance standards analysis.
2. Develop and adopt a mandatory energy-efficiency standard for at least one new appliance each year, per China's plans.
3. Develop energy labels.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The amount of energy saved and amount by which carbon emissions are reduced through the use of appliance standards.
2. Whether a national energy-efficiency standard and energy label are adopted for one new appliance annually.
3. The extent to which appliances actually meet energy-efficiency standards.
4. Whether a regular process of standards updates ("reach standards") becomes institutionalized at the national level.

**Goal #2: Help China develop and implement residential and commercial building energy codes in its central and southern climate zones.**

Means:
We can achieve this goal by helping China do the following.

1. Build institutional capacity in energy analysis, standards development, energy-efficient building design and operation, and policy formulation.
2. Ensure building energy codes in China's central and southern climate zones are enforced.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The amount of energy saved and amount by which carbon emissions are reduced due to new building energy codes.
2. Whether major cities in China's central and southern climate zones adopt and effectively implement new building energy codes.
3. The extent to which newly-constructed buildings comply with new codes. (Target: 50 percent of the total floor space in all newly-constructed buildings in major cities in China's central and southern climate zones to meet the new codes in 2010.)
4. Whether the Ministry of Construction adopts and enforces national building code implementation policies and regulations.

5. Whether the analytic capacity of domestic institutions is increased, facilitating future code development.

**China Sustainable Energy Program**
**Buildings Program Ongoing Projects**

**American Council for an Energy-Efficient Economy**

**Grant Date:** 7/1/2005 **Duration:** One year **Amount:** $10,000

***Description:*** To investigate the rate of compliance with energy-efficient lighting standards in China.

**Beijing Electric Light Source Research Institute**

**Grant Date:** 7/1/2005 **Duration:** One year **Amount:** $40,000

***Description:*** To investigate the rate of compliance with energy-efficient lighting standards in China.

**Beijing Hengyihe Research Institute of Building Energy Efficiency and Environmental Protection**

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $36,000

***Description:*** To conduct a cost-benefit analysis of energy-efficient buildings.

**China Building Energy Efficiency Association**

**Grant Date:** 12/1/2005 **Duration:** One year **Amount:** $55,000

***Description:*** To develop national reach building codes.

**Grant Date:** 4/1/2004 **Duration:** Fifteen months **Amount:** $60,000

***Description:*** To develop Typical Meteorological Year data for China to aid the implementation of building energy codes.

**China Certification Center for Energy Conservation Product**

**Grant Date:** 4/1/2004 **Duration:** One year **Amount:** $20,000

***Description:*** To help China develop a set-top box label and standard.

**Grant Date:** 5/1/2004 **Duration:** One year **Amount:** $40,000

***Description:*** To help China develop an energy-efficiency standard and energy label for consumer appliance power supplies.

**China National Institute of Standardization**

**Grant Date:** 12/1/2005 **Duration:** Six months **Amount:** $8,000

***Description:*** To translate and publish a guidebook for appliance standards and labels.

**Grant Date:** 12/1/2005 **Duration:** One year **Amount:** $36,000

***Description:*** To develop energy-efficiency standards and labels for variable-speed air conditioners.

**Grant Date:** 7/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To evaluate the implementation of China's mandatory energy labeling program.

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $40,000

***Description:*** To develop mechanisms to monitor and enforce compliance with energy-efficiency standards in China.

**Grant Date:** 4/1/2004 **Duration:** Eighteen months **Amount:** $55,000

***Description:*** To help China develop a national energy-efficiency standard for gas water heaters.

**Chongqing Construction Technology Development Center**

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $50,000

***Description:*** To support Chongqing to implement its residential building energy code.

**Collaborative Labeling and Appliance Standards Program**

**Grant Date:** 12/1/2005 **Duration:** Six months **Amount:** $10,000

***Description:*** To translate and publish a guidebook for appliance standards and labels.

**Fuzhou Sixin Science and Technology Promotion Center**

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $45,000

***Description:*** To support building code implementation in the Hot-Summer Warm-Winter (South China) climate zone.

**Energy Research Institute**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $35,000

***Description:*** To develop Tax and Fiscal Policies for Building Code Implementation.

**Guangdong Provincial Academy of Building Research**

**Grant Date:** 9/1/2003 **Duration:** One year **Amount:** $40,000

***Description:*** To continue support of the China Energy-Efficient Windows Initiative, which encourages Chinese energy-efficient windows manufacturers to help develop advanced building codes and to incorporate efficient windows into those codes.

**Guangzhou Institute of Building Science**

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $45,000

***Description:*** To support building energy code implementation in the Hot-Summer Warm-Winter (South China) climate zone.

**Information Center of the Ministry of Construction**

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To support building energy code implementation in the Hot-Summer Warm-Winter (South China) climate zone.

**Lawrence Berkeley National Laboratory**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To develop mechanisms to monitor and enforce compliance with energy-efficiency standards in China.

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $68,000

***Description:*** To help China develop a set-top box label and standard.

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $100,000

***Description:*** To support building energy code implementation in the Hot-Summer Warm-Winter (South China) climate zone.

**Grant Date:** 5/1/2004 **Duration:** Seventeen months **Amount:** $100,000

***Description:*** To help China develop a national energy-efficiency standard for gas water heaters.

**Grant Date:** 5/1/2004 **Duration:** One year **Amount:** $60,000

***Description:*** To accelerate the adoption of "reach" energy efficiency standards for appliances in Shanghai.

**Grant Date:** 5/1/2004 **Duration:** One year **Amount:** $60,000

***Description:*** To develop Typical Meteorological Year data for China to aid the implementation of building energy codes.

**Natural Resources Defense Council, Inc.**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $55,000

***Description:*** To provide training regarding international fiscal policies that increase energy efficiency in buildings.

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $12,000

***Description:*** To help China develop a set-top box label and standard.

**Grant Date:** 3/15/2003 **Duration:** Two years **Amount:** $100,000

***Description:*** To help China develop an energy-efficiency standard and energy label for consumer appliance power supplies.

**Research Institute for Fiscal Science**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To assist the Ministry of Finance and National Development and Reform Commission to develop Tax and Fiscal Policies to Promote Energy Efficient Products.

**Research Institute for Standards and Norms**

**Grant Date:** 2/1/2004 **Duration:** One year **Amount:** $20,000

***Description:*** To continue support of the China Energy-Efficient Windows Initiative, which encourages Chinese energy-efficient windows manufacturers to help develop advanced building codes and to incorporate efficient windows into those codes.

**Shanghai Energy Conservation Supervision Center**

**Grant Date:** 12/1/2005 **Duration:** One year **Amount:** $34,000

***Description:*** To accelerate Shanghai's adoption of reach appliance energy-efficiency standards.

**Grant Date:** 5/15/2004 **Duration:** One year **Amount:** $35,000

***Description:*** To accelerate the adoption of "reach" standards for appliances in Shanghai.

**Shanghai Municipal Housing Development Bureau**

**Grant Date:** 12/1/2004 **Duration:** Seventeen months **Amount:** $50,000

***Description:*** To assist China in developing incentive policies and market-driven programs for building code implementation in the Hot-Summer Cold-Winter (Central China) climate zone.

**Shenzhen Institute of Building Research**

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $45,000

***Description:*** To support building code implementation in the Hot-Summer Warm-Winter (South China) climate zone.

**Xiamen Academy of Building Research**

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $45,000

***Description:*** To support building code implementation in the Hot-Summer Warm-Winter (South China) climate zone.

# China Sustainable Energy Program
# Buildings Program Project Updates

***Goal #1: Increase the energy efficiency of household appliances by using energy-efficiency standards and energy labels.***

## Appliance Energy-Efficiency Standards

To date, grantees have helped develop mandatory energy-efficiency standards for refrigerators, air conditioners, fluorescent lamps, clothes washers, TV sets, and gas appliances (in Chongqing). These standards will cumulatively save 300 million metric tons of coal equivalent and reduce carbon emissions by 200 million metric tons by 2020.

Grantees are encouraging China to adopt a more modern approach by setting "reach" energy-efficiency standards. Traditionally, China sets easy-to-meet standards designed to eliminate the least efficient 15 percent of products on the market, and enforces the new standards within six months of issuing them. Superior energy-efficiency improvements are achieved through adopting "reach" standards, which "reach" for efficiencies of the most advanced products on the international market. Once a reach standard is established, manufacturers are typically given three years to raise the efficiency of all their products to meet the new standard. China's grantee-developed standards for refrigerators, air conditioners, fluorescent lamps, and TVs are all reach standards. The first three standards have been approved; the reach standard for TVs is pending approval.

New standards for power supplies and natural gas water heaters are currently being developed. Power supplies are the nearly universal "wall plugs" that convert high-voltage alternating current (AC) into low-voltage direct current (DC) for use by electronic devices. China produces 80 percent of the world's power supplies and is one of the world's largest users. With international assistance from the Natural Resources Defense Council (NRDC) and Ecos Consulting, the China Certification Center for Energy Conservation Products (CECP) is conducting market surveys, establishing testing procedures, and developing mandatory minimum energy performance standards for power supplies in both active and standby modes.

China's natural gas water heater sales have doubled since 1990, reaching eight million units in 2002. China is extending and expanding the capacity of gas pipeline networks nationwide, and gas appliance sales are exploding. The China National Institute of Standardization (CNIS) developed a national natural gas water heater standard based on Chongqing's successful model. This national standard is currently being reviewed by the Standardization Administration of China (SAC).

## Voluntary Standby Power Endorsement Labels and Mandatory Energy Information Labels

Energy-efficiency endorsement and information labels increase purchases of energy-efficient products. In the last three years, grantees have actuated the use of standby power endorsement labels in China. Standby power is the electricity used to power memory and remote control settings while appliances are "off." Potential energy savings coming from decreasing standby power are vast: in China, standby power leakage is more than three times higher than in the U.S., and represents as much as 10 percent of all residential electricity use.

With grantee assistance, China's first standby power endorsement label was adopted in April 2002 for TVs. In 2003, China developed standby power endorsement labels for five other products: DVD players, copiers, printers, fax machines, and power supplies. China is now piloting the use of these six voluntary standby power endorsement labels.

CSEP grantees are also helping China develop mandatory energy information labels. Information labels help consumers compare the efficiency and lifecycle energy costs of different appliances and equipment. NDRC issued the *Regulation of Mandatory Information Labels* in September 2004, and a nationwide mandatory information label program began in March 2005 with pilot projects for refrigerator and air conditioner energy information labels. Manufacturers are now required to attach labels to all refrigerators and air conditioners.

**Set-top Box Standards and Labels**

Set-top boxes (STBs), also known as Digital Television Adapters, provide access to digital television for existing analog TV sets. The market for STBs is on the verge of taking off in China: by 2015, 300 million households will be converted to digital cable. Complex STBs, which include a variety of functions such as recording, interactive programming, and decoding of encrypted signals, can waste up to 25 W in standby mode. Improving the efficiency of STBs by 20 percent would reduce carbon emissions by four million tons by 2015 and obviate the need for four large (500-MW) coal-fired power plants.

CECP, the Lawrence Berkeley National Laboratory (LBNL), and NRDC started developing STB energy-efficiency standards and consumer labels in March 2005. Since STBs are in the development stage both in China and internationally, grantees are working with international organizations to coordinate China's STB standards with those in the U.S., Europe, and Japan.

**Enforcing Energy-Efficiency Standards**

China's latest reach standard for room air-conditioners alone could reduce the nation's peak electricity demand in 2020 by 7,000 megawatts (equal to 14 large, 500-MW power plants). However, comprehensive enforcement mechanisms are needed to ensure that all manufacturers adhere to these standards.

CNIS and LBNL are helping China develop monitoring and enforcement mechanisms to implement energy-efficiency standards. The team is (1) analyzing international monitoring and enforcement experiences and China's implementation challenges; (2) developing a monitoring and enforcement framework for China with specific implementation guidelines; (3) setting up an "elimination system" for high energy-consuming products and setting penalties to be assessed by NDRC and the Administration of Quality Supervision, Inspection, and Quarantine (AQSIQ); (4) developing a list of key appliances to be included in China's annual national and local quality inspection regimes; (5) establishing a comprehensive monitoring system with input from industry associations, manufacturers, and related organizations; and (6) creating a professional registry and energy-efficiency information system to publicize energy-efficiency information.

**Evaluating Mandatory Energy-Efficiency Label Implementation**

China formally launched its mandatory energy-efficiency label program on March 1, 2005, starting with air conditioner and household refrigerator efficiency labels. The program has met early success: Vice Premier Zeng Peiyan recently commended the labeling program for promoting the production and use of energy-efficient products.

Before extending the labeling program to other home appliances, lighting products, and industrial equipment, however, it is essential to evaluate the implementation of these two pilot programs. CNIS is conducting such an evaluation: they are (1) identifying barriers to labeling implementation, (2) finding ways to improve monitoring of the labeling program, (3) checking for labeling accuracy on products, and (4) disseminating their findings to the media. CNIS is also training local supervision authorities and energy conservation centers on how to ensure local compliance with the mandatory labeling program.

**Recommendations**:

- The Chinese government needs to establish mechanisms to enforce appliance energy-efficiency standards and labels and penalize manufacturers for non-compliance.
- Government budgets should be increased to support the rapid adoption of more appliance standards, as well as hire and train new monitoring, inspection, and verification personnel. Enforcement teams are needed to inspect appliance factories and verify that appliance retail stores use available energy efficiency labels and only sell appliances that comply with latest energy efficiency standards.

**Evaluating the Implementation of Mandatory Lighting Equipment Efficiency Standards**

Lighting represents one of the largest uses of electricity in China; improvements in lighting technology could provide major energy savings. While China has mandatory energy efficiency standards in place, the implementation and enforcement of these standards is ineffective. The number of products on the market that comply is unknown and no penalties exist for non-compliance.

Grantees, the American Council for an Energy-Efficient Economy (ACEEE) and Beijing Electric Light Source Research Institute (BELSRI), are evaluating China's current lighting standard implementation. They are (1) identifying the barriers to standards enforcement, (2) testing products from different regions for standards compliance, (3) reporting results and disseminating findings via the media and workshops, and (4) providing recommendations to government agencies for improving standards compliance and upgrading existing lighting standards.

**Tax and Fiscal Policies for Promoting Energy-Efficient Products**

Home appliances in China are less efficient than those in industrialized countries. Higher prices impede the commercialization of the most energy efficient appliances and equipment; national incentive policies are needed to remove these market barriers. The Regional Finance Research

Division of the Ministry of Finance's Research Institute for Fiscal Science (RIFS) and CNIS have researched international incentive policies that promote energy-efficient products, prioritized products for fiscal policy support, and designed policies, as well as implementation plans, to speed the commercialization of energy-efficient appliances.

**Recommendation**: NDRC and MOF need to expedite the development of national tax and fiscal policies to promote energy efficient products.

**Shanghai Reach Standard Implementation**

China is the world's largest manufacturer of appliances and consumer electronics. As a result of grantee efforts, China's central government has started to issue more stringent reach energy-efficiency standards for such equipment. Such reach standards set high energy-efficiency requirements and then give manufactures 3-5 years to ensure all their products meet the standard. However, the central government has failed to allocate funding to accelerate the actual adoption of these reach standards. Because of its high living standards and frequent power shortages, Shanghai was chosen as a pilot city to adopt these reach standards ahead of national schedule.

After assessing the feasibility of accelerating the adoption of national reach standards for various appliances, the Shanghai Energy Conservation Supervision Center (SECSC) convinced the Shanghai municipal government to adopt the national reach standard for room air conditioners ahead of national schedule. The Shanghai municipal government has since incorporated the standard into its *11th Five-Year Energy Conservation Plan*. SECSC is now exploring ways to enforce this standard.

**Recommendation**: Shanghai's municipal government should establish a plan for the development and implementation—ahead of national schedule—of aggressive standards for the most energy-consumptive appliances and equipment sold within its jurisdiction. This will help Shanghai reduce peak electricity demand and cope with power shortages while establishing it as a leader in sustainable development.

***Goal #2: Help China develop and implement residential and commercial building energy codes in its central and southern climate zones.***

**Implementing Building Codes in the Hot-Summer Cold-Winter (Central China) Climate Zone**

State-of-the-art residential and commercial building codes have been developed by grantees and adopted at the national level, but without effective implementation the codes will have little impact on the building industry. Grantees in two pilot cities, Shanghai and Chongqing, are developing implementation and enforcement approaches to be replicated throughout the HSCW zone. Shanghai promulgated the *Shanghai Municipal Management Provisions for Building Energy Efficiency* in August, the first local provision on building efficiency in China. It regulates every step of the building process to ensure code compliance.

**Implementing Building Codes in the Hot-Summer Warm-Winter (Southern China) Climate Zone**

At the end of 2003, the Ministry of Construction (MOC) issued a new residential building code for the Hot-Summer Warm-Winter (HSWW; Southern China) climate zone. If effectively implemented, this code would reduce household energy use by 50 percent and eliminate the need for 11 large (500-MW) power plants within 10 years; poor implementation, however, would render the code impotent. This project seeks to ensure effective HSWW code implementation through both "bottom-up" and "top-down" approaches.

At the local level, grantees are helping MOC implement the new code in Guangzhou, Shenzhen, Fuzhou, and Xiamen. They are developing 3-to-5-year implementation plans, creating design software, establishing a labeling program for the most energy-efficient buildings, and creating local implementation regulations and policies. In addition, the four cities are strengthening the supervision of residential building construction for energy code compliance, sharing their experiences with other cities in the region, and developing policies to start implementing the new national commercial building code issued in April 2005.

At the central government level, MOC is developing *National Provisions for Building Energy Efficiency*, a national plan to ensure building code compliance, to submit to the State Council. Grantees are helping MOC develop a national regulatory framework, including provisions for monitoring the efficient design, construction, and operation of new buildings. MOC is working with cities not only in the HSWW area, but also in northern and central China, to incorporate local best practice monitoring and enforcement approaches into national policy.

**Implementing State-of-the-Art Commercial Building Codes in Shanghai**

A state-of-the-art commercial building code created by grantees Shanghai Tongji University (STU) and LBNL was adopted by the Shanghai municipal government in October 2003 and became effective in January 2004. Since then, STU has developed software to help implement the code and is training decision-makers, designers, and developers on its use. STU is also training professional inspectors on its use to facilitate building inspections for code compliance. If fully implemented, the code will cut energy consumption in commercial buildings in Shanghai by 50 percent.

**Implementing National Commercial Building Energy Codes**

The success of the Shanghai commercial building code pilot project prompted MOC to develop a national code. With help from the China Building Energy Efficiency Association, the China Academy of Building Research, and LBNL, MOC drafted a national commercial building code. It was approved in April 2005 and took effect on July 1, 2005. Implementation of the national code would reduce carbon emissions by 237 million tons by 2020. With the support of CSEP, six cities are now developing implementation and enforcement procedures to serve as a model for national replication.

**Tax and Fiscal Policies to Promote Energy-Efficient Buildings**

Combining strict enforcement of building energy codes with incentive policies ensures compliance with and encourages developers to actually exceed the codes' energy-efficiency

requirements. Meeting codes will improve buildings' energy efficiency and increase the market for new energy-efficient technologies.

The NDRC's Energy Research Institute (ERI) is analyzing incentive policies that can augment building codes and help stimulate the efficient buildings market. ERI has worked with domestic and international tax and fiscal policy and building efficiency experts to identify barriers facing energy-efficient products in China's buildings market and develop policy recommendations to overcome them. Their recommendations will be submitted to the Chinese central government.

**Energy Efficient Windows Program**

Windows are responsible for, on average, 25 to 30 percent of buildings' energy loss; to create efficient buildings, efficient windows are essential. With international assistance from LBNL and Alliance to Save Energy, the China Standards and Norms Research Institute designed an efficient window labeling program, and submitted an implementation plan to MOC ministers for approval in August 2005. The energy efficient window program aims to help developers and designers select windows that will allow their buildings to meet energy-efficiency code requirements. If the program is approved, CSEP will work on both the local and national levels to help MOC implement the program nationwide.

# China Sustainable Energy Program
# Electric Utilities Program Strategy

***Overarching goal: Steer investments in China's power sector away from fossil fuel-based electricity generation toward energy efficiency and renewable energy.***

**Goal #1: Help China develop and implement policies that maximize energy efficiency and renewable energy use in the power sector.**

Means:
We can achieve this goal by helping China do the following.

1. Develop national policies, e.g. public benefits charges, renewable portfolio standards, tax incentives, distributed generation policies, integrated resource planning, to minimize overall power usage and maximize renewable energy generation.
2. Conduct energy-efficiency and renewable-energy policy pilot projects worthy of national replication in at least two provinces.
3. Apply integrated resource planning principles when siting and developing new generation facilities to inject least-cost planning principles into competitive generation markets.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. Whether national energy-efficiency and renewable-energy policies are adopted and the extent to which they are effectively implemented.
2. Whether at least two provinces conduct energy-efficiency and renewable-energy policy pilot programs and the extent to which the policies are effective.
3. The amount of energy saved, amount of renewable energy deployed, and amount by which carbon emissions are reduced due to energy-efficiency and renewable-energy policies affecting the electric utilities sector.

**Goal #2: Help China establish strong emissions and energy-efficiency regulations for power plants in order to shift China's electricity generation investments away from coal-fired power plants toward cleaner generation facilities and demand-side energy efficiency.**

Means:
We can achieve this goal by helping China do the following.

1. Adopt a cap-and-trade program for power plants based on "generation performance standards" (GPS).
4. Develop GPS pilot programs in at least two provinces.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. Whether national power plant emissions and energy-efficiency policies are adopted and the extent to which they are effectively implemented. (Target: GPS-based policies to limit $SO_2$ emissions to 4.3g $SO_2$/kWh by 2010 and 3.2g $SO_2$/kWh by 2020.)
2. Whether at least two provinces conduct GPS pilot programs and the amount by which the programs decrease emissions and increase energy efficiency.

3. The amount of investment in cleaner generation facilities and amount of demand-side energy savings affected by GPS-based policies.

# China Sustainable Energy Program
# Electric Utilities Program Ongoing Projects

**Beijing Energy Efficiency Center**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $32,000

***Description:*** To develop national DSM policies, incorporate DSM into power sector reforms, and coordinate provincial DSM pilots.

**China Agriculture University**

**Grant Date:** 11/1/2004 **Duration:** Six months **Amount:** $25,000

***Description:*** To generate policy and regulatory recommendations for natural gas power generation under a competitive power market.

**Chinese Research Academy of Environmental Sciences**

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $70,000

***Description:*** To develop policies and regulations to implement a generation performance standard-based pollutant emissions cap-and-trade program.

**Energy Research Institute**

**Grant Date:** 11/1/2004 **Duration:** One year **Amount:** $50,000

***Description:*** To generate policy and regulatory recommendations for natural gas power generation under a competitive power market.

**Guangdong Energy Conservation Center**

**Grant Date:** 8/1/2004 **Duration:** One year **Amount:** $50,000

***Description:*** To develop and implement demand-side energy efficiency policy programs in Guangdong Province.

**Institute of Economic System and Management**

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $150,000

***Description:*** To build regulatory capacity for implementing sustainable energy policies in China.

**Natural Resources Defense Council, Inc.**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $100,000

***Description:*** To develop national DSM policies, incorporate DSM into power sector reforms, and coordinate provincial DSM pilots.

**Regulatory Assistance Project**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $220,000

***Description:*** To provide technical support and comprehensive best regulatory practices training on integrating public benefits into power sector restructuring.

**Shanghai Energy Conservation Supervision Center**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $40,000

***Description:*** To develop DSM policies and programs in Shanghai.

**State Power Economic Research Center**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $48,000

***Description:*** To develop national DSM policies, incorporate DSM into power sector reforms, and coordinate provincial DSM pilots.

# China Sustainable Energy Program
# Electric Utilities Program Project Updates

***Goal #1: Help China develop and implement policies that maximize energy efficiency and renewable energy use in the power sector.***

**Power Sector Regulation Reform and Environmental Protection**

In the past, China had only one electric utility, the state-owned State Power Corporation (SPC). China is now breaking up SPC's monopoly, dividing the company into regional transmission and local distribution companies. Grantees are trying to ensure these new electric utility companies are required to invest in energy efficiency and renewable energy.

The Institute of Economic System and Management (IESM), formerly part of the defunct State Council Office for Restructuring the Economic System (SCORES) and now under the National Development and Reform Commission (NDRC), coordinated a multi-ministerial project that designed an independent regulatory body to oversee national power sector regulatory reforms and ensure utilities are required to invest in energy efficiency and renewable energy. Based on IESM's report, the State Council established the State Electricity Regulatory Commission (SERC) in March 2003.

Since then, per SERC's request, grantees, in particular the Regulatory Assistance Project (RAP), have worked with IESM to train SERC personnel. SERC has already established six regional and several provincial offices, with a total staff of around 1,000. IESM's work in 2005 focused on helping SERC establish regional regulatory agencies and formulate regulations encouraging clean energy generation and demand-side management.

**Recommendation**: More revenues pass through electric utilities than any other business. Government regulation of electric utilities is justified because of the substantial public interest in having reliable, efficiently and cleanly produced electricity. China's utility regulatory bodies will largely determine utilities' environmental impact and must safeguard these public goods. Policy-makers should

- Mandate that utilities spend at least 2 percent of all revenues mitigating the public health and environmental impact of fossil-fuel-based electricity generation;
- Design utility sector regulations that reduce the environmental impact of electricity production;
- Require utilities to supply or purchase a specified amount of electricity from renewable sources;
- Require utilities to invest in energy saving end-use technologies when cheaper than increasing production capacity; and
- Provide utilities with a return on energy-efficiency investment equal to or greater than returns on increased production.

**Demand-Side Management (DSM) Policy Analysis**

China has managed its escalating power demand largely through load management practices; institutional and policy barriers, particularly a lack of mechanisms to fund efficiency programs through electricity rates, have prevented China from aggressively pursuing more cost-effective approaches focused on improving end-use efficiency. With assistance from international DSM experts at the Natural Resources Defense Council (NRDC) and RAP, the State Power Economic Research Center (SPERC) and the Beijing Energy Efficiency Center (BECon) are beginning to tackle barriers to utility-financed DSM programs, educating central government policy makers in DSM and its strategic importance in improving energy efficiency.

With the assistance of SPERC, BECon, NRDC, and RAP, DSM pilot programs in Jiangsu, Shanghai, and Guangzhou are achieving significant electricity savings. Jiangsu, in particular, has become a national exemplar in DSM implementation: over the past three years, more than 1.4 billion RMB (US $175 million) in public and private DSM investment have yielded annual energy savings of over 930 million kilowatt-hours (kWh), reducing peak demand by 350 MW and saving 590 million RMB (US $74 million).

Now, with international assistance from NRDC and RAP and co-funding from the Asian Development Bank (ADB), the State Grid Corporation DSM Instruction Center (SGC-DSMIC) is developed an Energy Efficiency Power Plant (EPP) project in Jiangsu. EPP is a bundled set of energy efficiency programs designed to deliver the energy and capacity equivalent of a large conventional power plant. By implementing EPPs, Jiangsu could cut peak electricity demand by over 600 megawatts (MW) at only a quarter of the cost of building a new power plant of equivalent production capacity. SGC-DSMIC is now refining the EPP program design and developing an implementation action plan.

**Recommendations**:

- China should institutionalize demand-side energy efficiency as a fundamental sustainable development tool in the electricity sector. Electricity regulatory agencies at the national, regional, and provincial levels should ensure that utilities meet energy needs at the lowest "all-in" cost and should require every utility in China to implement DSM programs.
- China should reform its tariff structures so that utilities recoup their investment in demand-side energy-savings technologies. SERC should adopt a revenue cap approach to eliminate potential conflicts of interest for utilities when implementing DSM projects.
- China should establish a national fund that provides matching funds to provinces for DSM projects.

***Goal #2: Help China establish strong emissions and energy-efficiency regulations for power plants in order to shift China's electricity generation investments away from coal-fired power plants toward cleaner generation facilities and demand-side energy efficiency.***

**Generation Performance Standards**

Generation performance standards cap power plant emissions based on the amount of electricity they produce, encouraging energy efficiency and cleaner electricity generation. Over the past two years, the Chinese Research Academy of Environmental Sciences (CRAES) and local grantees have helped GPS gain wide-spread acceptance in China. In 2002-2003, with guidance from SEPA and cooperation from local Environmental Protection Bureaus (EPBs), CREAS conducted local generation performance standards (GPS) pilot projects in Zhejiang, Shangdong, Shanxi, and Jiangsu provinces. In 2004, CRAES developed GPS for sulfur dioxide emissions and a policy and regulatory framework ensuring GPS monitoring and enforcement.

In the past year, CRAES convinced SEPA to (1) build a GPS-based total emissions control mechanism to limit thermal power plant emissions for China's *11th Five-Year Plan*; (2) design an emissions trading program to supplement GPS and conduct test it at the provincial level; (3) develop procedures to enforce GPS; and (4) develop GPS training programs for provincial officials.

**Recommendation**: SEPA should include generation performance standards for power plant emissions in the national total emissions control strategy and develop regulations for GPS enforcement.

**Internalizing Environmental Costs into China's Electricity Tariffs**

China's power tariff-setting practices have two main problems: they (1) neglect environmental and public health externalities associated with fossil fuel-fired power generation and (2) discourage utilities from making cost-effective energy efficiency improvements. The Chinese Research Academy of Environmental Sciences (CRAES) is addressing the first of these two shortcomings: CREAS developed management methods and policies internalizing environmental costs into electricity tariffs and submitted its policies to SEPA, NDRC, and SERC. NDRC and SEPA will consult CREAS's recommendations when designing new tariff-setting mechanisms to help utilities recoup the costs of investing in demand-side energy-saving technologies.

CREAS also recommended incentives for coal-fired power plants fitted with sulfur scrubbers and energy pricing options for inefficient industries. These recommendations were included in NDRC's latest *Implementation Methods for Power Tariff Reform*. Now, CRAES is working with the NDRC's Institute of Economic Research to design power tariff-setting mechanisms that give greater support to clean power generation and DSM.

**Recommendations**:

- China's electricity tariffs should fully internalize the environmental costs of electricity generation to create a level competitive playing field for energy efficiency and renewable energy.

- China should supplement electricity tariffs with pollution levies and other environmental policies.

**Natural Gas Power Generation Regulations and Incentive Policies**

In an effort to reduce pollution and diversify power generation methods, the Chinese government is developing and implementing regulations and incentive policies to increase natural gas power generation. Since the environmental costs of conventional coal-fired power generation are not internalized into China's power tariffs, the cost of electricity generated by natural gas power plants is higher that electricity generated by conventional coal-fired plants. NDRC and SERC want to change this.

A team of experts from the Energy Research Institute (ERI) and State Power Economic Research Center (SPERC) have reviewed natural gas power generation policies used in other countries; (2) studied how to utilize natural gas most efficiently and the role of power generation in natural gas market development; (3) assessed the technical and economic feasibility of integrating gas-fired power plants into China's power market; and (4) developed pricing, investment, and market-entry policies and regulations for natural gas power generation. ERI's reports have been submitted to NDRC and SERC for consideration.

**Recommendation**: China should fully internalize the environmental costs of power generation into power tariffs, and implement regulations and incentive policies that level the competitive playing-field for natural gas power generation.

# China Sustainable Energy Program
# Industry Program Strategy

***Overarching goal: Help China develop and implement policies that increase energy efficiency in the industrial sector.***

**Goal #1: Help China develop and utilize industrial energy-efficiency agreements to increase the energy efficiency of its most energy-intensive industrial enterprises.**

Means:
We can achieve this goal by helping China do the following.
1. Set energy-efficiency targets for China's highest-energy-consuming industrial sectors.
2. Develop regulations and incentive policies, particularly tax and fiscal policies, to compel enterprises to set and meet strong energy-efficiency targets.
3. Evaluate and monitor companies' progress in reaching energy-efficiency targets.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.
1. The number of metric tons of coal equivalent (tce) of industrial energy saved and amount by which carbon emissions are reduced through the use of industrial energy-efficiency agreements.
2. Whether energy consumption per unit industrial output declines.

**Goal #2: Help China develop and implement mandatory energy-efficiency standards for industrial equipment.**

Means:
We can achieve this goal by helping China do the following.
1. Develop and implement mandatory energy-efficiency standards for major industrial equipment, focusing on the most carbon-intensive equipment first.
2. Develop energy labels for industrial equipment.
3. Establish supervision systems at the national and provincial levels to monitor standards compliance and labels use.
4. Develop incentive policies to promote the manufacture and use of energy-efficient equipment.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.
1. The number of metric tons of coal equivalent (tce) of industrial energy saved and amount by which carbon emissions are reduced through the use of industrial equipment standards.
2. Whether mandatory energy-efficiency standards and energy labels for major equipment are adopted.
3. Whether manufacturers implement energy-efficiency standards effectively.
4. Whether a regular process of standards updates ("reach standards") becomes institutionalized at the national level.

# China Sustainable Energy Program
# Industry Program Ongoing Projects

## American Council for an Energy-Efficient Economy

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $40,000

***Description:*** To develop a reach energy-efficiency standard for pumps in China.

**Grant Date:** 4/1/2005 **Duration:** Six months **Amount:** $32,000

***Description:*** To fund six grantees' attendance at the 2005 ACEEE Summer Study on Energy Efficiency in Industry.

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $15,000

***Description:*** To conduct a feasibility study on developing reach energy-efficiency standards for industrial equipment.

**Grant Date:** 12/1/2003 **Duration:** Eighteen months **Amount:** $25,000

***Description:*** To develop a reach energy-efficiency standard for electric motors in China.

## Beijing Sustainable Development Center

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $40,000

***Description:*** To support the development of cogeneration policies, including grid interconnection regulations.

## Beijing University

**Grant Date:** 12/1/2005 **Duration:** One year **Amount:** $100,000

***Description:*** To set energy-efficiency targets and develop regulations, incentive policies, and monitoring mechanisms for the China Top-1000 Enterprises Energy-Efficiency Program.

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $40,000

***Description:*** To develop a policy for the combined use of pollution levies and energy efficiency agreements in China's iron and steel sector.

## China Energy Conservation Association

**Grant Date:** 8/1/2003 **Duration:** One year **Amount:** $15,000

***Description:*** To support the implementation of the Sector Target Voluntary Agreement pilot program in China's Shandong province.

**China Energy Conservation Investment Corporation**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $35,000

***Description:*** To develop tax and fiscal policies for industrial-sector energy efficiency.

**Grant Date:** 5/1/2004 **Duration:** One year **Amount:** $30,000

***Description:*** To develop Energy-Efficient Technology Guidelines for China's highest-energy-consuming industrial enterprises.

**China National Institute of Standardization**

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To develop reach energy-efficiency standards for pumps in China.

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $15,000

***Description:*** To conduct a feasibility study on developing energy-efficiency reach standards for industrial equipment.

**Grant Date:** 12/15/2003 **Duration:** Eighteen months **Amount:** $35,000

***Description:*** To develop a reach energy-efficiency standard for electric motors in China.

**Lawrence Berkeley National Laboratory**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $45,000

***Description:*** To develop tax and fiscal policies for industrial-sector energy efficiency.

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $34,000

***Description:*** To design industrial energy-efficiency agreements for China.

**NOVEM**

**Grant Date:** 10/1/2003 **Duration:** One year **Amount:** $40,650

***Description:*** To support the implementation of the Sector Target Voluntary Agreement pilot program in China's Shandong province.

**Shandong Association for Resources Comprehensive Utilization**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To implement the industrial-sector energy-efficiency agreement pilot program in Shandong province.

**South-North Institute for Sustainable Development**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $35,000

***Description:*** To analyze China's *Energy Conservation Law* and compare it to international best practice policies for promoting energy efficiency.

# China Sustainable Energy Program
# Industry Program Project Updates

***Goal #1: Help China develop and utilize industrial energy-efficiency agreements to increase the energy efficiency of its most energy-intensive industrial enterprises.***

**Industrial Enterprise Energy-Efficiency Agreements**

China's government is starting to use European-style Energy-Efficiency Agreements (EEAs) to improve energy efficiency and reduce carbon emissions in major industries. EEAs are voluntary agreements in which individual enterprises or sectors pledge to meet specific energy-savings or emission reduction targets. They provide a means of reaching national energy-savings and air-quality goals without adopting mandatory regulations. In a pilot EEA program, Jinan Steel and Iron Group and Laiwu Steel and Iron Group entered an agreement with the Shandong provincial government to reduce carbon emissions by a million metric tons over a three year period. Both are ahead of schedule in attaining this goal.

The China Iron and Steel Association (CISA) analyzed how to utilize more EEAs in China's steel and iron sector based on this successful model. The National Development and Reform Commission (NDRC) now plans to expand the program to the national level, entering a voluntary agreement with the iron and steel sector as a whole.

**Combining Energy-Efficiency Agreements and Pollution Levies**

Pairing EEAs with strong regulations, e.g. pollution levies and/or incentive policies, compels industries to set and meet strong energy-savings targets. China already assesses a pollution levy on high-energy-consuming industrial enterprises. Grantees Beijing University and Lawrence Berkeley National Laboratory (LBNL) propose combining this levy system with EEAs; they recommend refunding the levy to enterprises that commit to meeting aggressive energy-efficiency targets and use the funds to do so.

Key officials at NDRC and the State Environmental Protection Administration (SEPA) support their proposal and requested Beijing University design an implementation plan. Beijing University is now (1) assessing the impact of substantially higher pollution levies on enterprises' energy efficiency technology investment, (2) designing policies dictating this joint use of pollution levies and EEAs in the iron and steel sector, (3) assisting the Shandong EEA pilot program's implementation of their proposed policies, and (4) developing tools to measure the energy savings and emission reductions resulting from their policies.

**Tax and Fiscal Policies to Increase Energy-Saving Technology Investment**

There is little capital investment in energy-saving technology in China. One reason for this is enterprises have difficulty obtaining loans for technical upgrades because China's state-owned banks are unaccustomed to providing and disinclined to incur the higher service costs associated with relatively small energy-efficiency loans. Another reason is energy cost savings count as taxable revenue, which creates a disincentive to invest in energy-saving technology. Well-designed tax and fiscal policies are needed to correct these market failures.

Based on cost-benefit analysis and European, Japanese, and U.S. best practice, LBNL and the China Energy Conservation Investment Corporation (CECIC) designed tax and fiscal policies to increase energy-saving technology investment in the industrial sector. There is growing support for a policy they modeled on the successful U.K. carbon levy program, which taxes high-energy consuming enterprises but refunds most of the tax if enterprises meet aggressive energy savings targets. Reduced energy consumption prompted by the program has not only lowered carbon emissions in the U.K., it has also increased enterprises' profits.

**Recommendation**: NDRC and SEPA should spread the joint use of incentive policies and EEAs nationwide. For example, require all high-energy-consuming enterprises to pay a heavy pollution levy that is refunded to the extent enterprises meet the targets set by aggressive energy-efficiency commitments.

### Fleshing out the *Energy Conservation Law*

If China's *Energy Conservation Law* (ECL) were fully implemented, China's total energy consumption would be reduced by 800 million metric tons of coal equivalent by 2020. However, ECL is too general to be well implemented.

The grantee South-North Institute for Sustainable Development (SNISD), in consultation with several Chinese and international experts, assessed the strengths and weaknesses of ECL and compared it to international best practice. From their analysis, they recommended specific energy efficiency and renewable energy policies to flesh out ECL and make it more effective.

### ACEEE Summer Study

This summer, the American Council for an Energy-Efficient Economy (ACEEE) held its biennial summer workshop on industrial energy efficiency, the most internationally respected conference of its type. Chinese attendees had the opportunity to consult with international experts and compare Chinese energy-efficiency practices to international best practice. ACEEE funded six Chinese delegates' attendance at the conference.

## *Goal #2: Help China develop and implement mandatory energy-efficiency standards for industrial equipment.*

### Reach Standards for Industrial Equipment

The China National Institute of Standardization (CNIS) is developing "reach standards" for energy-consuming equipment. Reach standards are efficiency standards that "reach" above current market average to best international efficiency levels. Once a reach standard is established, manufacturers are typically given three years to raise the efficiency of all their products to meet the new standard.

Assisted by ACEEE, CNIS is developing a reach standard for electric motors. CNIS aims to complete the standard this year and recommend the Standardization Administration of China make it effective in 2008. The standard would improve the average efficiency of industrial motors by three percent, saving 27 million tons of coal equivalent (tce) and reducing carbon emissions by 21 million metric tons by 2020.

**Reach Standards for Water Pumps**

ACEEE and CNIS are also developing an energy-efficiency reach standard for clean water centrifugal pumps, the pump most commonly used in industrial processes. The team aims to have the standard adopted in 2007 to go into effect in 2010. ACEEE and CNIS are (1) comparing the efficiency of traditional and clean water centrifugal pumps in both the domestic and international markets, (2) conducting manufacturer surveys to identify barriers to meeting a reach pump standard, (3) holding stakeholder workshops, (4) drafting the standard, and (5) developing strategies to encourage enterprises to invest in and utilize the more efficient pumps.

**Recommendation**: NDRC and SAC should accelerate the development and implementation of energy-efficiency standards for industrial equipment, including motors, pumps, and compressors. MOF should substantially increase budgets for standards development and implementation personnel at the national, provincial, and local levels.

# China Sustainable Energy Program
# Renewable Energy Program Strategy

***Overarching goal: Encourage bulk purchases of renewable energy by China's electric utilities and independent power producers in order to drive down the cost and speed the adoption of renewable-energy technologies.***

**Goal #1: Help China set and meet aggressive targets for national and provincial renewable energy deployment, particularly by using renewable portfolio standards, public benefits charges, incentives for distributed generation technologies, and renewable energy pricing regulations.**

Means:

We can achieve this goal by helping China do the following.

1. Per *Renewable Energy Law* mandate, adopt and enforce a legally-binding national renewable energy target.
2. Develop mandatory market share (MMS) policy pilot programs.
3. Grant wind concessions to increase investment in large-scale wind energy development.
4. Encourage investment in distributed generation technologies and develop renewable energy microgrids.
5. Establish "green pricing" programs to increase local markets for renewable energy.

Evaluation Criteria (Key Performance Indicators):

We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. Whether a national renewable portfolio standard is established in China and how effectively it is implemented. (Target: at least 10 percent of all electricity to come from renewable energy sources, particularly wind, by 2020.)
2. The number of megawatts of new renewable energy facilities installed as a result of provincial renewable energy policies, e.g. MMS policies and system benefits charges.
3. Whether a national wind concession policy is adopted and the amount of investment in large-scale wind development within the government-awarded concessions.
4. Whether rural microgrids are established, augmenting volume purchases of renewable energy.
5. Whether major utilities adopt green pricing programs to increase new renewable energy development.

# China Sustainable Energy Program
# Renewable Energy Program Ongoing Projects

## Beijing Oriental Environment Research Institute

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $35,000

***Description:*** To develop mechanisms to monitor the implementation and enforcement of the *Renewable Energy Law*.

## Center for Renewable Energy Development, Energy Research Institute

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $70,000

***Description:*** To formulate detailed implementation regulations for China's *Comprehensive Renewable Energy Policy*.

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $80,000

***Description:*** To develop policies and delineate a roadmap for the development of a wind power industry in China.

**Grant Date:** 8/1/2004 **Duration:** One year **Amount:** $80,000

***Description:*** To design national and provincial mandatory market share policies and implementation plans.

## Center for Resource Solutions

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $180,000

***Description:*** To provide international best practice training and capacity building for the CSEP renewable energy program.

## Center for Science and Technology Development

**Grant Date:** 8/1/2002 **Duration:** One year **Amount:** $60,000

***Description:*** To develop fiscal policies aimed at removing market barriers to investment in new biomass-electricity-generation technologies.

## Fujian Energy Research Society

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To continue support for renewable energy mandatory market share pilots in Fujian province.

**Institute of Electrical Engineering, Chinese Academy of Sciences**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $25,000

***Description:*** To formulate a solar photovoltaic technology development and utilization plan for China's *11th Five-Year Plan*.

**Shanghai Energy Conservation Supervision Center**

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $20,000

***Description:*** To design a regulation and certification system for Shanghai's green pricing program.

**Sichuan University**

**Grant Date:** 6/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To continue support for renewable energy mandatory market share pilot programs in Sichuan province.

**Tsinghua University Education Foundation**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To design mechanisms for implementing China's *Comprehensive Renewable Energy Policy*.

**Grant Date:** 4/1/2004 **Duration:** One year **Amount:** $25,000

***Description:*** To develop policies supporting distributed renewable energy in rural China.

# China Sustainable Energy Program
# Renewable Energy Program Project Updates

***Goal: Encourage bulk purchases of renewable energy by China's electric utilities and independent power producers in order to drive down the costs and speed the commercialization of renewable-energy technologies.***

## Using Mandatory Market Share Policies to Reach National Renewable Energy Goals

Heeding the *Renewable Energy Law* call for China to develop a total volume target for renewable energy, the National Development and Reform Commission (NDRC) recently drafted its *2020 Renewable Energy Development Plan* and *Renewable Energy Target Allocation Plan.* Together, the documents propose a high total national renewable energy development target—twelve percent of all electricity is to come from renewable energy sources by 2020—as well as targets for individual renewable energy technologies such as wind and biomass.

These goals will not be achieved, though, without supporting regulations and policies. One form of regulation that can help China reach these targets is mandatory market share (MMS) policies. MMS policies require utilities to supply or purchase a specific percentage of electricity from renewable energy sources. Utilities are allowed to achieve their renewable energy goals through installation of renewable facilities and/or purchase of tradable renewable energy credits. The Center for Renewable Energy Development (CRED) and international consultants from the Center for Resource Solutions (CRS) are now working with policymakers in China's central and provincial governments to develop a national MMS policy and implementation strategy.

In addition to its work on national MMS policies, CRED has actuated the establishment of MMS targets for renewable energy sources of 14 percent in Fujian Province and 10 percent in Sichuan Province by 2015. Now, with support from CRED and international guidance from the World Bank and Global Environment Facility's China Renewable Energy Scale-up Program, the Fujian Energy Research Society and Sichuan University are implementing these two and designing other local MMS pilots.

**Recommendation**: NDRC should require at least ten percent of all electricity produced in China come from renewable sources by 2020, using renewable energy market share requirements to meet this national goal.

## Wind Concession Projects

Wind concessions are another tool used to increase renewable energy use. A wind concession is a grant of land in a wind-rich area awarded through competitive bidding. The developer offering to provide wind electricity at the lowest price per kilowatt-hour wins the concession; utility companies then enter a power purchase agreement (PPA) with the developer, agreeing to purchase electricity produced at developers' bid price. Using wind concessions together with PPAs increases wind energy investment and stimulates competition among wind energy providers, lowering the price of wind energy.

With international assistance from CRS, CRED drafted a policy framework, implementation strategy, and comprehensive guidebook for wind concession projects in China. To date, NDRC

has approved four projects totaling 1,100 megawatts (MW) of capacity and representing an investment of approximately US $1.1 billion. Winning bids have ranged from 4.8 to 6.8 U.S. cents/kWh, a significant reduction from the cost of previous wind farms. There are difficulties, however: one significant concern is that some project developers may be proposing unrealistic prices to win contracts. CRED is assessing the impact and how to mitigate the risk of this problem. CRED has also developed a power tariff structure and evaluated factors affecting wind power prices.

**Recommendation**: Hasten implementation of wind concession programs in all wind-rich areas. The up-front costs of these projects should be distributed nationally, not borne locally.

**Local and National Public Benefits Funds Supporting Renewable Energy Development**

Wires charges, also known as public benefits charges or system benefits charges, are small surcharges collected from either generators or consumers on all kWh flowing through the transmission and distribution grid. These funds can be used for energy-efficiency, renewable-energy, and energy technology research and development programs.

Local government agencies in Hebei, Fujian, and Jiangsu provinces have already established local public benefits funds (PBFs) to implement demand-side management (DSM) programs. Last year, the NDRC's Energy Research Institute (ERI), CRED, the Beijing Energy Efficiency Center (BECon), the NDRC's Institute of Economic Research (IER), and the Ministry of Finance's (MOF) Financial Research Institute reviewed domestic and international clean energy funds and designed a PBF scheme for China. Their scheme uses utility-funded wires charges, higher electricity rates reflecting environmental costs, pollution fees, and government financing to support energy-efficiency and renewable-energy projects.

The newly-approved *Renewable Energy Law* also requires the establishment of a special renewable energy fund. CRED has drafted *Renewable Energy Special Fund Management Methods* and submitted it to MOF and NDRC, the agencies responsible for the implementation of this new renewable energy fund, for review.

**Recommendation**: Establish a national PBF that provides matching funds to provinces for energy-efficiency and renewable-energy programs. Such a fund would complement national renewable energy MMS programs.

**Interconnection Tariffs and Cost-sharing for Grid-Connected Renewable Energy**

The *Renewable Energy Law* calls for mandatory renewable energy development targets and requires that utilities purchase all qualified renewable energy power at a fixed power tariff. Developing and institutionalizing appropriate tariff and cost-sharing mechanisms is essential to implement and enforce these new policies.

CRED and Tsinghua University, with guidance from the Energy Bureau and NRDC's Department of Pricing, have developed principles and economic assessment tools for

determining tariff levels for various renewable energy technologies and establishing incremental cost-allocation schemes. NDRC is now considering their recommendations.

**Recommendation**: Electricity tariffs should incorporate the higher up-front costs of renewable energy technologies, and the incremental costs of renewable energy should be spread to all consumers nationwide.

### Wind Power Industry Development Roadmap

China relies heavily on foreign loans and imported wind turbines to develop its abundant wind resources. To develop local capacity and reduce costs, the Chinese government wants to develop large commercial wind projects using local manufacturers. China has succeeded in developing a moderate domestic market through a series of wind concession projects. However, a lack of strong domestic manufacturing, service, and maintenance capacity remains a barrier to NDRC's latest plan, installing at least 20 GW of wind by 2020.

CRED, the China Renewable Energy Industry Association (CREIA), China Wind Energy Association, utilities, and wind manufacturers are now working together to (1) analyze the pros and cons of local wind turbine manufacturing; (2) survey international experience in wind development; and (3) create policies to promote the development of China's local wind industry. The culmination of this work will be a concise roadmap for wind industry development in China. As part of the project, the Center for Resource Solutions (CRS) is providing a summary of international best practices.

**Recommendation**: Encourage bulk wind energy projects to increase market demand for local wind turbines and attract investment into the wind industry.

### Green Electricity Pricing Regulations

The higher up-front development costs of renewable energy are a principal barrier to renewable energy use and commercialization, particularly in China where costs are borne only by customers living adjacent to generation facilities. Green pricing, a program allowing customers to pay a small surcharge on their electricity bills to cover the incremental cost of renewable energy, supports greater utility investment in renewable energy.

With international assistance from CRS and co-funding from the World Bank, the Shanghai Energy Conservation Supervision Center (SECSC) and the Shanghai Economic Commission have designed a green pricing program for Shanghai. The Shanghai Municipal Government has already approved the SECSC's *Green Pricing Mechanisms* and *Green Electricity Management Methods*, and twelve industrial consumers have purchased Shanghai's first batch of green electricity.

**Recommendation**: The government should encourage more cities to adopt green pricing programs and more utilities to develop new renewable energy power generation projects to expedite the commercialization of renewable energy in China.

**Distributed Renewable Energy Development**

Conventional energy policies perpetuate inequitable access to electricity. In 2000, urban households in China's four richest coastal provinces consumed about two and half times as much energy as households in poorer interior provinces and many rural households have no access to electricity at all. The Chinese government is addressing these inequities, and has already invested billions of dollars in rural energy development. Conventional energy policies, however, emphasize a centralized distribution system of commercial energy. Such an approach to rural electrification is high cost and increases fossil fuel use.

Distributed renewable energy microgrids can provide a cost-effective and clean alternative to costly utility grid (transmission line) extensions. There are barriers to their use, however, including high capital costs, unclear incentive policies, and a lack institutional support from the central government. The China Energy Research Society (CERS) recently analyzed ways to overcome these barriers through government policies and financing mechanisms. They drafted the *Study of Investment Mechanisms for Off-Grid Electricity Generation Systems in Rural China* and recommended that the government increase its investment in rural off-grid distributed generation systems, including a subsidy program for remote, rural households.

Then, last year, Tsinghua University analyzed current and projected future rural energy demand—developing scenarios and a rural energy consumption indicator system for 2020—and identified policy options to promote distributed renewable energy development in rural areas. This year, the Chinese Academy of Sciences's Institute of Electric Engineering assisted NDRC's Energy Bureau to develop the *11th Five-Year Plan for Solar Photovoltaics*. The Energy Bureau is now finalizing the plan.

**Recommendation**: Incorporate distributed renewable energy power generation and rural energy development into the State Council's *Western Development Plan*. Provide financial incentives to spread renewable energy microgrids to remote areas.

# China Sustainable Energy Program
# Transportation Program Strategy

***Overarching goal: To improve air quality, reduce vehicle emissions in China by promoting cleaner vehicles, and reform transportation systems.***

**Goal #1: Help introduce advanced-technology, electric-drive vehicles into China's fleet in significant, and increasing, volumes.**

Means:

We can achieve this goal by helping China do the following.

1. Identify the technical, economic, and institutional barriers to advanced-technology-vehicle (ATV) commercialization and delineate a feasible policy roadmap for ATV development.
2. Develop policies and standards regulating the development and sale of hybrid vehicles.
3. Secure significant funding for the development and industrialization of advanced-technology buses, trucks, and cars from the Asian Development Bank, European Union, United Nations Development Programme, World Bank, and other international development organizations.
4. Conduct provincial and municipal pilot policy projects designed to develop ATV technical capacity and increase ATV sales in China.

Evaluation Criteria (Key Performance Indicators):

We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The amount of funding allocated for the research, development, and industrialization of ATVs in China.
2. Whether China adopts policies promoting ATVs.
3. Whether provincial and municipal pilot policy projects expand local ATV technical capacity and increase ATV sales in China.

**Goal #2: Increase the efficiency and reduce the emissions of conventional-technology vehicles.**

Means:

We can achieve this goal by helping China do the following.

1. Develop strong vehicle emissions regulations and fuel quality standards.
2. Strengthen premier research institutions' capacity to conduct transportation sector-related technical analysis, especially their ability to model transportation-sector policies' effect on air quality and calculate fuel quality standards' impact on the cost of fuel refinement.
3. Develop and implement aggressive fuel economy standards and other regulations promoting vehicle fuel efficiency.
4. Develop national policies promoting clean and alternative vehicle fuels and fuel technologies.

Evaluation Criteria (Key Performance Indicators):

We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The extent to which new conventional vehicles meet world-class emissions standards.

4. Whether vehicle emissions and fuel economy modeling analyses are considered credible and compelling both inside and outside of the State Environmental Protection Agency.
5. Whether tighter vehicle fuel quality standards are adopted and enforced.
6. Whether aggressive fuel economy requirements are adopted and enforced.

**Goal #3: Promote and help China develop sustainable transportation systems, especially bus rapid transit (BRT).**

Means:
We can achieve this goal by helping China do the following.
1. Educate central, provincial, and municipal authorities about the benefits of transportation system reform.
2. Develop BRT policies and technical guidelines to stimulate the spread of BRT systems to major cities throughout the country.
3. Develop strategies for improving the efficiency of local transportation systems.
4. Plan and establish pilot BRT systems in at least two Chinese cities.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.
1. Whether superior BRT systems are established in at least two Chinese cities.
2. Whether policies promoting BRT are adopted and enforced.
3. Whether urban transportation plans and policies take not only the efficiency, but also the environmental impact, of transportation systems into account.

# China Sustainable Energy Program
# Transportation Program Ongoing Projects

## Beijing Automotive Research Institute

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $120,000

***Description:*** To help the Beijing Municipal government develop an action plan to retrofit its diesel vehicle fleet in order to decrease their emissions.

## Beijing Transportation Development Research Center

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $150,000

***Description:*** To help the Beijing Municipal Committee of Communication develop its first bus rapid transit (BRT) operation/management plan and implement its near-term BRT network development plan.

## Beijing Vehicle Tailpipe Emissions Management Center

**Grant Date:** 10/1/2004 **Duration:** One year **Amount:** $55,000

***Description:*** To support the Beijing Environmental Protection Bureau to develop a vehicle emissions labeling system to promote the purchase of cleaner vehicles and encourage vehicle owners to scrap old dirty vehicles.

## Chang'an University

**Grant Date:** 11/1/2004 **Duration:** One year **Amount:** $80,000

***Description:*** To support the Xi'an municipal government to develop bus rapid transit (BRT) network plans and design BRT demonstration corridors.

## Chengdu Institute of Urban Planning and Design

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $100,000

***Description:*** To help the Chengdu municipal government develop a detailed implementation plan for its bus rapid transit system.

## China Academy of Transportation Science

**Grant Date:** 4/1/2004 **Duration:** Two years **Amount:** $100,000

***Description:*** To support the development of a national sustainable transportation strategy for China and disseminate it to senior central government leaders and ministries.

**China Academy of Urban Planning and Design**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $80,000

***Description:*** To support the Ministry of Construction (MOC) to develop policies to promote bus rapid transit system development in Chinese cities.

**China Automotive Technology and Research Center**

**Grant Date:** 11/1/2005 **Duration:** One year **Amount:** $120,000

***Description:*** To develop a fuel tax for China.

**Grant Date:** 7/1/2005 **Duration:** One year **Amount:** $150,000

***Description:*** To support the National Development and Reform Commission to develop a light-duty truck fuel economy standard.

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $100,000

***Description:*** To help the National Development and Reform Commission develop a mandatory vehicle fuel efficiency labeling system to promote the purchase of fuel-efficient vehicles.

**Grant Date:** 4/1/2004 **Duration:** One year **Amount:** $80,000

***Description:*** To work with the National Development and Reform Commission to develop technical standards and certification management policies that would allow hybrid vehicles to enter the market.

**Grant Date:** 4/1/2004 **Duration:** One year **Amount:** $70,000

***Description:*** To support the National Development and Reform Commission to develop incentive policies to promote the market penetration of hybrid vehicle technologies.

**Grant Date:** 4/1/2004 **Duration:** One year **Amount:** $100,000

***Description:*** To support the National Development and Reform Commission to conduct a policy study on an implementation mechanism for fuel-efficiency policies.

**Grant Date:** 10/1/2004 **Duration:** One year **Amount:** $120,000

***Description:*** To support the Beijing Environmental Protection Bureau to develop a Euro-IV fuel quality standard and enforcement mechanisms to ensure the implementation of Beijing's Euro-III and Euro-IV vehicle emissions standards.

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $100,000

***Description:*** To analyze the environmental and energy-savings benefits of establishing market-oriented incentive mechanisms for vehicle technology improvement and transportation system reform.

**China National Petroleum and Chemical Planning Institute**

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $100,000

***Description:*** To help the National Development and Reform Commission develop a national strategy for alternative fuels.

**Energy and Transportation Technologies, LLC**

**Grant Date:** 12/1/2004 **Duration:** Two years **Amount:** $50,000

***Description:*** To analyze the feasibility and cost-effectiveness of applying fuel efficiency technologies to China's light-duty truck and heavy-duty vehicle fleet and research where to set light-duty truck and heavy-duty vehicle fuel efficiency standards.

**Global Environment Institute**

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $50,000

***Description:*** To support initial-stage development of an independent non-governmental "Sustainable Transportation Center" to provide technical outreach to Chinese cities seeking to solve urban transportation challenges through bus rapid transit system development.

**Harvard University Office for Sponsored Research**

**Grant Date:** 7/1/2004 **Duration:** One year **Amount:** $65,000

***Description:*** To help the National Development and Reform Commission, the Ministry of Science and Technology, and the China Automotive Technology and Research Center develop policies for hybrid technology promotion in China.

**Institute for Transportation Development Policy**

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $100,000

***Description:*** To analyze the financial structure of both international and Chinese public transit development and recommend fiscal policies to encourage public transit development in China.

**International Sustainable Systems Research Center**

**Grant Date:** 12/1/2005 **Duration:** One year **Amount:** $70,000

***Description:*** To support the International Sustainable Systems Research Center's collaboration with domestic experts to develop a model of vehicle emissions in Chinese cities.

**Jinan Municipal Engineering Design and Research Center**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To help the Jinan municipal government develop a bus rapid transit (BRT) development strategy and BRT pilot project.

**Kunming Urban Transportation Planning Institute**

**Grant Date:** 12/1/2005 **Duration:** One year **Amount:** $75,000

***Description:*** To continue to improve Kunming's bus-priority transit system.

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $60,000

***Description:*** To continue assistance to the Kunming Municipal government to make further improvements on their bus priority transit system.

**Grant Date:** 11/1/2003 **Duration:** One year **Amount:** $100,000

***Description:*** To help the Kunming municipal government develop a comprehensive demonstration of a bus rapid transit (BRT) system.

**Shanghai Academy of Environmental Sciences**

**Grant Date:** 4/1/2005 **Duration:** One year **Amount:** $70,000

***Description:*** To analyze the environmental and public health costs of vehicle emissions in order to encourage a vehicle emissions control policy and advanced technology development in Shanghai.

**Shenzhen Research Center of Municipal Development**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $100,000

***Description:*** To help the Shenzhen Environmental Protection Bureau develop policies to control vehicle emissions in Shenzhen.

**Tianjin Electric Drive Vehicle Research Cneter**

**Grant Date:** 12/1/2004 **Duration:** One year **Amount:** $70,000

***Description:*** To support the Tianjin municipal government to demonstrate and commercialize hybrid vehicles, especially hybrid buses.

**Tongji University**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $80,000

***Description:*** To help the Shanghai Municipal Government promote and demonstrate advanced technology vehicles.

**Tsinghua University Education Foundation**

**Grant Date:** 11/1/2004 **Duration:** One year **Amount:** $75,000

***Description:*** To support the State Environmental Protection Agency to analyze the impact of fuel quality (especially sulfur content) on vehicle emissions and air quality and delineate a plan for improving the quality of gasoline and diesel fuel.

**Grant Date:** 7/1/2004 **Duration:** Two years **Amount:** $75,000

***Description:*** To establish China-based models to analyze current and future environmental problems associated with emissions from urban transportation.

**Grant Date:** 6/1/2004 **Duration:** One year **Amount:** $80,000

***Description:*** To support the State Environmental Protection Administration to develop a vehicle emissions control plan for the next five years.

# China Sustainable Energy Program
# Transportation Program Project Updates

***Goal #1: Facilitate the introduction of advanced, hybrid-electric drive technology vehicles into China's fleet in significant, and increasing, volumes.***

**Hybrid Vehicle Performance Standards Development**

Based on previous work analyzing the policy barriers to introducing advanced technology vehicles, the China Automotive Technology and Research Center (CATARC) recommended developing technical regulations for commercializing hybrid technology. The regulations include performance standards—which are the preconditions for hybrid vehicle manufacturing. CATARC is working to develop hybrid vehicle performance standards and complementary policies for the National Development and Reform Commission (NDRC) and the Ministry of Science and Technology (MOST). The team is analyzing and identifying key performance standards elements, and developing standards and test procedures for certification—particularly emissions and fuel efficiency tests as well as complementary technical policies and certification management procedures. With CATARC's assistance, the Standardization Administration of China (SAC) adopted four hybrid-related testing procedures and standards in August. By the end of this year, the government should be able to complete the development of hybrid certification procedures, making hybrids available on the market and valid for use.

**Incentive Policies for Commercializing Hybrid Vehicles**

In parallel with the development of hybrid vehicle performance standards, CATARC is assisting NDRC to develop a package of hybrid vehicle preference policies in order to speed up commercialization. These policies include (1) financial incentives for manufacturers, dealers, and consumers to buy and sell hybrid-electric vehicles, (2) preference policies for industrial development, investment, and international cooperation on hybrid vehicle technologies; for example, ease hybrid vehicle joint venture approval procedures, and (3) subsidies and incentives to apply hybrid technologies to specific fleets, including bus fleets, commercial fleets, government fleets, and taxis.

**International Collaboration to Promote Hybrid-Electric Vehicles**

The John F. Kennedy School of Government at Harvard University is assisting NDRC, MOST, and CATARC to develop hybrid vehicle promotion policies, including (1) surveying and summarizing international technical and economic policies that promote hybrid and other advanced technology vehicles, (2) tailoring such international practices to China's conditions, and (3) exploring opportunities for international cooperation and incentives to attract hybrid vehicle technologies to China.

**Promoting the Commercialization of Advanced Clean Vehicles in Shanghai**

In addition to the efforts made at the national level, grantees are also working at the municipal level to conduct policy pilot projects in promoting advanced vehicle technologies. Shanghai intends to lead China in putting advanced technology vehicles on the road. The Shanghai municipal government allocated $45 million in matching funds to MOST's *863 Program* to develop advanced vehicle technologies (ATVs). Tongji University, the *863 Program's*

coordinator, made significant progress by developing an electric power train system and a fuel cell car platform, which puts ATVs closer to commercialization. Yet, Shanghai lacks a comprehensive action plan. Tongji University is assisting the Shanghai municipal government with developing an action plan to introduce and demonstrate ATVs. Tongji is analyzing and recommending preferential policies and government incentive mechanisms, such as "zero-emissions vehicle" mandate programs modeled on that of the State of California, as well as an environmental grading system. Tongji is also developing an action plan to introduce hybrid vehicles for the 2010 World Expo. As a results of these efforts, Shanghai Municipal Government set up its target in "Shanghai Eleventh Five-Year Energy Conservation Plan" to introduce over 100 thousand hybrid vehicle to Shanghai fleet by 2010.

**Hybrid-Electric Vehicle Industrialization and Commercialization Strategies**

Technical, commercial, and policy barriers must be addressed before the industrialization and commercialization of hybrid-electric vehicles can be realized. The Tianjin Electric Vehicle Research Center (TEVRC), using Japanese and US case studies, is analyzing Tianjin's potential for the industrialization and commercialization of HEVs and developing solutions to barriers. TEVRC is submitting its recommendations to the Tianjin municipal government.

**Recommendations**:

- Develop and implement technical regulations that provide hybrid vehicle technologies with access to the market as soon as possible.
- Require government-sponsored procurement of hybrid vehicle fleets, such as taxi and government ministry vehicle fleets, so that, through volume purchases, the costs of hybrids come down and hybrid technology enters the market more rapidly.
- Conduct local hybrid technology demonstration projects with preference policies and clear targets for hybrid introduction. For example, California catalyzed the development of hybrid-electric vehicles by requiring all manufacturers to sell 10 percent "zero-emissions vehicles" within the state, with partial credit for sales of hybrids. This policy has launched a global revolution in advanced vehicle technologies. China could be a leader in similar policies.

***Goal #2: Increase the efficiency and reduce the emissions of conventional technology vehicles.***

***1. Fuel Efficiency Standards***

**Fuel Efficiency Implementation Policies**

After a three years of work by CATARC, NDRC finally adopted China's first fuel efficiency standard, *Fuel Consumption Limits for Passenger Vehicles*. The standard went into effect on July 1. Fuel economy standards are the single most vital tool to reduce China's oil dependence. CATARC is now formulating recommendations for the enforcement of the standards, including institutional and administrative structures, penalties for vehicle models that fail to meet the standards, testing procedures, and government supervision mechanisms. These recommendations, if adopted by the government, will ensure that every vehicle sold in China complies with the standards.

### Light-Duty Truck Fuel Efficiency Standard

China currently has 700,000 light-duty trucks (LDTs). International experience has shown that if stringent fuel efficiency regulations fail to include LDTs, auto manufacturers will shift from producing passenger vehicles to producing heavier LDTs (e.g., sport utility vehicles), resulting in a decline in overall fleet fuel efficiency and increased national dependence on oil imports. CATARC is leading a research team to analyze current LDT fuel efficiency levels and the potential for improving them. CATARC is studying the improvement potential and overall relative benefits of advanced fuel efficiency technologies as well as analyzing the oil savings potential of LDT standards. CATARC will submit the LDT fuel efficiency standard to NDRC and the Standardization Administration of China (SAC).

### Mandatory Labeling System

In parallel with fuel efficiency standards development and enforcement efforts, CATARC is assisting NDRC and SAC with developing a mandatory fuel efficiency labeling system requiring manufacturers to affix labels on their vehicles. This labeling system could encourage consumers to select highly efficient vehicles. CATARC is leading a group of experts to work closely with NDRC's Department of Industrial Policy and Department of Environment and Energy Comprehensive Utilization to survey international vehicle fuel economy labeling systems, analyze China's vehicle mix, design an appropriate labeling system, and analyze the barriers to implementing the labeling system.

**Recommendations**:

- Fully enforce the "Fuel Consumption Standard for Light-Duty Passenger Cars"; no exceptions to rigorous enforcement should be allowed. This more than any other measure will help to assure China's oil security.
- Establish a powerful enforcement body and implementation mechanism to supervise the implementation of fuel efficiency standards.
- Quickly adopt fuel efficiency standards for light-duty trucks and heavy-duty vehicles.
- Develop incentive policies (including financial incentives, fuel tax, and labeling systems) to promote rapid market adoption of fuel efficient vehicles.

## *2. Vehicle Emissions and Fuel Quality Improvement*

### National Vehicle Emissions Control Strategy Development

China requires vehicles to meet Euro-III emissions standards in 2007 and Euro IV in 2010. But with the rapid rise in the vehicle population, a comprehensive national control strategy is crucial to curbing deteriorating air quality. The Institute for Environmental Science and Engineering of Tsinghua University is supporting the State Environmental Protection Administration (SEPA) to (1) analyze the current status and trends of vehicle pollution in several Chinese cities, (2) determine vehicle emissions reduction targets that allow proposed air quality standards to be achieved in those cities, (3) analyze the technical feasibility and cost effectiveness of various vehicle emission standards and their adoption scenarios, and (4) recommend achievable vehicle emission standards and implementation schedules.

## Fuel Quality Improvement

China's poor fuel quality is a primary contributor to deteriorating urban air quality and is the main barrier to aggressive tailpipe emission standards as well as the introduction of advanced technology vehicles. The government is pushing the oil industry to improve fuel quality, but several factors hamper progress. Tsinghua University, the China Research Academy of Environmental Sciences, and the China Petroleum Development Planning Institute are working together to assist SEPA with developing a national strategy to reduce sulfur in China's gasoline and diesel fuels, and to encourage a schedule of fuel improvement that follows the national schedule of vehicle emissions control.

## Vehicle Pollution Modeling

China needs state-of-the-art modeling tools that calculate the public costs of current and future vehicle emissions levels. The International Sustainable Systems Research Center (ISSRC), the Institute of Environmental Science and Engineering at Tsinghua University (IESETU), and Wuhan University of Technology are working to increase the sophistication of vehicle emissions and air quality models to bolster the case for stringent vehicle emissions standards and the introduction of low- and zero-emission vehicles.

## Beijing Vehicle Emissions Controls

Facing increased pressure to improve its air quality for the 2008 Olympics, the Beijing municipal government is taking aggressive measures to address its deteriorating air quality, including developing stringent enforcement mechanisms for Euro-III emissions standards and corresponding fuel quality standards as well as diesel vehicle retrofits. The success of these two projects will speed up efforts throughout China. Grantees are working to assist the Beijing Environmental Protection Bureau (BEPB) to (1) design a roadmap for diesel vehicle retrofitting, including policy mechanisms and identifying available technology, (2) develop policies to ensure that only new Euro-III (and above) vehicles can be sold in Beijing, (3) develop fuel quality standards and enforcement policies, and (4) establish a labeling system that helps consumers identify vehicles with superior vehicle emissions and higher mileage.

## Shanghai Vehicle Emissions Impacts and Controls

Shanghai, China's economic center, is struggling to balance economic development with environmental protection. Shanghai has adopted several policies that encourage cleaner vehicles, but these policies have made only marginal progress in controlling vehicle emissions. In the first phase of this project, the Shanghai Academy of Environmental Sciences (SAES) successfully demonstrated the relationship between air quality and vehicle emissions. SAES established a vehicle emissions and air quality simulation model that analyzed the benefits and costs of various vehicle emissions control policies. The second phase is now under way; SAES is submitting policy recommendations to the Shanghai municipal government that encourage the commercialization of advanced vehicle technologies through implementation of stringent vehicle emissions standards and heavy-duty vehicle emissions controls. This project is expected to develop into a vehicle emissions control policy pilot in Shanghai. If successful, the pilot could become a model for national replication.

**Shenzhen Public Vehicle Fleets (Buses and Taxicabs) Emissions Control**

The Shenzhen Environmental Protection Bureau (EPB) is working to control its vehicle emissions, especially fleet emissions. The Shenzhen Research Center of Municipal Development is assisting the Shenzhen EPB with developing policies to manage and control vehicle emissions. Shenzhen is set on developing aggressive strategies, such as hybrid technologies, retrofitting, and vehicle emissions standards, to reduce vehicle emissions. Shenzhen is also eager to inject hybrid technologies into its taxi and bus fleets. Grantees have conducted a survey on Shenzhen's policies and available technology. They are now analyzing international experience in retrofitting bus and taxi fleets. Shenzhen EPB has also been in contact with hybrid vehicle manufacturers to analyze the feasibility of using hybrids in their taxi fleets.

**Recommendations**:

- Develop sophisticated enforcement systems for implementing vehicle emissions standards.
- Establish a financial mechanism—including a fuel tax and fuel pricing system—to require oil companies to improve fuel quality as soon as possible. Advanced technology vehicles must have clean fuels; without clean fuels immediately, China will fall further behind in advanced vehicle technology.
- Establish a schedule to adopt more stringent vehicle emissions standards; this schedule should reflect a similar schedule for cleaning up fuels.
- Develop economic policies to promote cleaner vehicles.
- Establish a schedule to adopt fuel quality standards to meet vehicle emissions control requirements.

### *3. Alternative Clean Fuels*

**National Alternative Fuel Development Strategy**

Alternative fuels, if based on renewable and recyclable resources, together with advanced clean vehicle technologies, will significantly reduce petroleum usage as well as criteria pollutant and global warming emissions. This project supports NDRC's strategy to develop alternative fuels and clean vehicle technologies. The China National Petroleum and Chemical Planning Institute (NPCPI) and the China Society of Automobile Engineering (SAE) are conducting a survey on the supply and demand structure of China's fuels market and are projecting China's future oil demand. They are analyzing lifecycle environmental, energy, and economic ("Triple E") impacts from various fuel and vehicle options, as well as the technical and economic feasibility and barriers for fuels and vehicle technologies with the best Triple E. The team is submitting policy recommendations to NDRC that promote alternative fuels development in China.

### *4. Capacity Building*

**Tsinghua Fellowship Project**

Tsinghua University has superb technical and analytical capacity and provides substantial support to government policy-making institutions. Tsinghua's scientific and technical support for transportation policy is particularly strong. The fellowship program at Tsinghua University

enables graduate students and postdoctoral fellows to provide full-time analytical support to CSEP-funded transportation policy projects. Tsinghua graduate students select research projects that (1) encourage sustainable transportation, (2) address strategic issues that will affect the future environmental sustainability of China's transportation sector, and (3) identify comprehensive technical and policy options for central, provincial, and local government support for sustainable transportation development.

### *5. Fiscal polices*

**Fiscal Policies for promoting cleaner and more efficient vehicle technologies**

While China is just beginning to manage the tradeoffs associated with increased personal mobility, other nations have been working on solutions for some time. The EU, Japan, Canada, and the US have all developed public policies to mitigate the negative side effects of personal vehicle use and promote a more sustainable transportation sector. A critical challenge is to design an appropriate set of fiscal policies for the transportation sector. Fiscal policies generate revenue to cover investment costs. As importantly, fiscal policies can create mechanisms to capture the negative externalities of transportation use, thereby sending the proper signals to users. The Ministry of Finance (MOF) is currently considering reforming several vehicle tax and fiscal policies, which provides grantees with an immediate opportunity to promote clean and efficient vehicles. CATARC is assisting MOF in reforming the vehicle excise tax and consumption tax to reflect energy and environmental considerations. CATARC held an international conference on "Fiscal Policies for Promoting Cleaner and More Efficient Vehicle Technologies," in which Chinese government officials, domestic researchers, and international experts assessed fiscal policies that could promote sustainable transportation in China. Following up on this momentum, CATARC is working with international experts to (1) introduce international best fiscal policy practices in promoting clean and efficient vehicle technologies; (2) review and provide feedback on the current Chinese fiscal policy system for vehicle and transportation systems; and (3) recommend fiscal policies to MOF and NDRC to help promote sustainable transportation in China.

**Fuel Tax**

Rapid economic development and auto industry growth are increasing China's demand for imported oil at a time when oil prices are skyrocketing and the devastating environmental effects of vehicle emissions are becoming more obvious. Fuel prices in China are low, facilitating high vehicle usage and purchase rates. Fuel taxes are used in many nations and have proven to be an extremely effective tool for limiting vehicle usage, thereby reducing transportation fuel demand and improving air quality. China Automobile Technology and Research Center (CATARC) and other fiscal policy research institutes will (1) research the effects vehicle and fuel taxes implemented abroad have had on countries' fuel consumption, economy, and social life; (2) study the respective impacts of different types of fuel taxes and different fuel tax rates; (3) consult with international fuel tax experts; (4) design a fuel tax system; and (5) submit the system to MOF.

***Goal #3: Promote and help China develop sustainable transportation systems, especially bus rapid transit (BRT).***

**National Sustainable Transportation Strategy Development**

China lacks a national transportation strategy; no high-level plan prioritizes sustainable transportation development or recognizes the serious energy and environmental costs of *laissez-faire* transportation development. Currently, multiple agencies oversee different elements of transportation system development, leading to myriad interagency conflicts. The China Academy of Transportation Science (CATS) is establishing a task force under the China Council for International Cooperation on Environment and Development (CCICED) to formulate a national sustainable transportation plan that (1) specifies an institutional framework for overseeing sustainable transportation development, (2) plans an integrated, multi-modal transportation system, and (3) delineates a roadmap for China's sustainable transportation policy development.

**The China Sustainable Transportation Center**

Our Transportation Program has made extraordinary progress in spreading the word on bus rapid transit (BRT). National and municipal interest (now 20 cities) is burgeoning. Pilots in Beijing, Kunming, and Jinan are fully underway; Chengdu, Chongqing, Xi'an, and Shanghai are all conducting BRT feasibility studies and planning BRT corridors. The program's rapid expansion, however, is challenged by a lack of local technical capacity.

To handle the capacity shortfall, we launched the China Sustainable Transportation Center (CSTC) over the last year. CSTC is increasingly viewed as an important technical resource to the main Chinese cities (Beijing, Kunming, Jinan, Xi'an, Hangzhou) either currently building or in advanced stages of planning BRT systems. CSTC's goal is to provide BRT and transportation systems outreach and technical assistance to all Chinese cities that seek it; international transportation systems experts will be in residency to teach short courses on the elements of sustainable transportation policy, and CSTC staff will work closely with municipal officials, planners, and engineers in China's leading BRT cities.

**Policies Promoting Bus Rapid Transit in China**

China lacks national policies promoting BRT development nationwide. The China Academy of Urban Planning and Design (CAUPD) is helping the Ministry of Construction (MOC) develop such policies. CAUPD has organized a group of local and international experts to (1) survey the current status of public transit systems in China, (2) identify barriers to BRT development, (3) analyze strategies for BRT development in different-sized Chinese cities, and (4) develop policies regarding BRT financing, BRT operation and management, multi-modal transportation integration, and urban planning.

**Financing Public Transit Development**

BRT is making great progress at the municipal level with pilots underway in many major Chinese cities. Lack of sufficient financial support, however, is a potential barrier to BRT's long-term development in China. In Beijing, the first city to construct a proper BRT system,

BRT construction was jointly funded by the municipal government and bus companies. Those bus companies, in turn, invited private investors to fund construction around BRT stations.

This public-private financial structure lacks clearly defined roles and responsibilities for its stakeholders, especially the financial responsibilities of the government in promoting public transit systems. The Institute for Transportation and Development Policy (ITDP) is currently analyzing both international and Chinese financing methods for public transit development and will recommend policies designed to secure financing for the long-term development BRT and other sustainable public transit systems.

**Beijing BRT Development**

Traffic congestion caused by rapid vehicle population growth is a bottleneck to Beijing's sustainable development. To ease traffic congestion and help redress the economic losses and environmental destruction caused by the transportation sector, the Beijing Transportation Development Research Center (BTDRC) created a BRT development and demonstration strategy for Beijing and convinced the Beijing municipal government to implement it.

Beijing is currently constructing its first BRT corridor; it will be fully operational by the end of this year. With a length of 16 km and a capacity of 20,000 passengers per hour in each direction, the corridor will link southern suburbs with the urban center. Beijing's second and third BRT corridors are being designed and will begin construction next year. The Beijing municipal government is committed to building six corridors, 100 km in total length, by 2010.

**Kunming BRT Development**

Kunming is a public transportation pioneer and the first Chinese city to have a centralized dedicated-bus-lane system. In 2003, Kunming had two transportation corridors with some BRT characteristics. We began supporting the Kunming Urban Transportation Planning Institute (KUTRI) in 2003 to improve these existing dedicated-bus-lanes and help the municipal government design new BRT corridors. In early 2004, KUTRI completed its *Guidelines for the Planning and Design of Dedicated-Bus Lanes* and designs for 44 km of new BRT corridors.

More recently, though, Kunming's bus-priority system has been weakening due to design limitations and operational issues, and public complaints are increasing. In response, KUTRI analyzed barriers to upgrading Kunming's system to become a truly world-class BRT system and created plans to further extend Kunming's BRT network. Their analyses show that improvements in system operation, particularly the ticketing system, bus routing, and bus lanes, are most critical. Based on this analysis, KUTRI has created plans to optimize routes and operational management, improve bus-lane infrastructure, and create a new ticketing system. These improvements are all currently underway. In July 2005, upgrades on Beijing Road's 4.5-km-long BRT corridor and the construction of a new dedicated-bus-lane were completed.

**Jinan BRT Development**

As in many other Chinese cities, daily gridlock in Jinan is increasing. Jinan's municipal government is turning to BRT, rather than less flexible, more expensive rail development, to alleviate the growing pressure on its existing transportation system. The Jinan Urban Planning and Design Institute, Jinan Municipal Civil Engineering Design Institute, and China Academy of

Urban Planning and Design recently launched BRT development project in Jinan. Jinan finished designing and will start construction in October on its first BRT corridor. The corridor is 18 km long and located in northern Jinan. The Jinan municipal government is committed to constructing additional corridors to form a "#"-type BRT network with a total length of 60 km. This network will handle the majority of trips within Jinan's urban area by 2010.

**Xi'an BRT Development**

Xi'an recently received a $240 million World Bank loan to strengthen its transportation infrastructure. Prior to Xi'an's receiving the loan, a research team led by Chang'an University and the Xi'an Urban Planning Institute helped convince the Xi'an municipal government to integrate BRT into the city's master urban plan and develop eight bus-priority corridors. Now the same group is developing BRT plans for Xi'an, in an effort to ensure that BRT is a centerpiece of the World Bank's transportation infrastructure improvement project. In specific, Chang'an University and the Xi'an Urban Planning Institute are (1) conducting urban transportation surveys and creating traffic simulations; (2) identifying the best roads on which to develop BRT corridors and drafting infrastructure designs; (3) designing systems for BRT operation and management; (4) identifying candidate BRT vehicles; and (5) recommending financial and institutional structures to ensure the long-term development of BRT in Xi'an.

**Chengdu's BRT Development**

Chengdu's vehicle population has grown by 20 percent each of the past two years; it now has the second largest private vehicle fleet in China, smaller only than Beijing's. In 2003, Chengdu was poised to build a second ring road system destined to replicate the problems experienced with Beijing's ring roads until grantee the Chengdu Institute of Urban Planning and Design (CIUPD) persuaded the Chengdu municipal government to integrate BRT into its second ring road construction as part of a comprehensive "Transit-Oriented Development" (TOD) plan.

TOD makes public transportation the focus for urban planning, incorporating public transit on all roadways. Chengdu's applying TOD principles and integrating BRT into its second ring road could facilitate the expansion of BRT in Chengdu. With massive road construction planned in the near term, Chengdu could become a model of truly sustainable transportation development for a mid-sized Chinese city.

Currently, CIUPD is designing systems for the operation and management of the second ring road BRT corridor and developing plans for an integrated BRT network for Chengdu. The network plans include a BRT corridor connecting the new second ring road BRT corridor to the city center.

**Chongqing's BRT Development**

The southwestern municipality of Chongqing faces severe transportation challenges, including traffic congestion and increased vehicle emissions. Its problems are compounded by the city's lack of physical space. With an urban population of over seventeen million, the municipal government wants to develop modern public transportation systems employing clean vehicle technologies to alleviate growing environmental crises.

Chongqing is home to a major bus manufacturer interested in pursuing hybrid technology. In December 2003, CSEP met with the Chongqing municipal government, Chongqing Bus Company, and Chongqing Bus Manufacturer. All parties agreed to promote a BRT system that uses hybrid bus technologies. Chongqing could become China's first city to create a BRT system that uses hybrid bus technologies. So far, grantees have completed preliminary BRT development feasibility and traffic flow studies.

**Shanghai's BRT Development**

Due to the enormous investment, construction-time, operational-cost requirements of subways, Shanghai's municipal government is seeking alternative ways to create an efficient and affordable public transportation system. In 2004, the World Resources Institute's EMBARQ Transportation Center (funded by the Shell Foundation) collaborated with CSEP's Transportation Program to create a BRT development strategy for Shanghai. After receiving positive feedback from the mayor's office, we have passed the baton to a local team headed by the Shanghai Urban Transport Bureau, which is further developing Shanghai's BRT plans. They completed the project in April 2005, drafting a *BRT Network Planning and Design Study in Shanghai*, an *Investigation Report of Public Traffic Flow and Road Service Level*; and *BRT Planning for the Road from Pudong South Road to Yaohua Road*. Further collaborative projects are now under discussion.

**Recommendations**:

- The central government should designate BRT as the main approach to the development of sustainable urban transportation in China, providing financial support for and encouraging BRT development in all major cities.
- China should develop BRT systems in several cities to serve as sustainable transportation system exemplars, worthy of domestic, even global, imitation.
- China should develop incentive policies and provide technical guidance to promote BRT development across the country.

# China Sustainable Energy Program
# Low-Carbon Development Paths Program Strategy

***Overarching goal: Encourage energy policies, particularly "all-in costs" energy pricing, that take into account the full social and environmental impact of energy consumption.***

**Goal #1: Help China develop "sustainable energy futures" scenarios anticipating the impact of today's energy policy decisions.**

Means:
We can achieve this goal by helping China do the following.

1. Develop sustainable-energy policy analysis tools and encourage long-term planning agencies at the central and provincial government levels to use them.
2. Develop scenarios for the 1999-2020 timeframe showing the impact of energy policies on carbon emissions. Implement policies effecting the greatest carbon emissions reductions.
3. Develop and implement national tax and fiscal policies designed to achieve China's goal of quadrupling GDP by 2020 while only doubling energy use.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The extent to which sustainable energy scenarios are credible, in circulation, and utilized by China's senior policy decision-makers.
2. The extent to which sustainable energy policy analysis tools and techniques are adopted by Chinese non- and quasi-governmental energy policy organizations.
3. The amount by which carbon emissions are reduced as a result of low-carbon-development policies.

**Goal #2: Help China develop and encourage China to adopt "all-in costs" pricing of fossil fuels.**

Means:
We can achieve this goal by helping China do the following.

1. Quantify and publicize the social and environmental costs of fossil fuel combustion.
2. Develop tax, fiscal, and/or economic policies that bring China closer to "all-in costs" energy pricing.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The extent to which the social and environmental costs of fossil-fuel combustion become internalized.
2. The extent to which central and provincial government agencies adopt externalities charges on fossil fuels, increasing incentives for improving energy efficiency and using renewable energy.
3. The extent to which central and provincial government decision-makers utilize analytical tools weighing the true, "all-in" costs and benefits of fossil-fuel combustion, energy efficiency, and renewable energy.

**Goal #3: Encourage China's State Council (cabinet) to issue energy efficiency and renewable energy policy directives to central, provincial, and local governmental entities in order to expedite policy development and implementation in all program areas.**

Means:
By monitoring State Council dockets, respond to energy-related issues under consideration by the State Council and urge the inclusion of energy efficiency and renewable energy policy recommendations in State Council discussion.

Evaluation Criteria (Key Performance Indicators):
We support and evaluate projects based on their ability to deliver measurable progress in the form of key performance indicators. Overall progress includes these metrics.

1. The extent to which the State Council acknowledges the importance of energy efficiency and renewable energy as solutions to critical social and environmental problems.
2. The extent to which State Council directives regarding energy efficiency, renewable energy, and related environmental performance expedite the adoption and implementation of energy efficiency and renewable energy policies at the national, provincial, and local levels, thereby reducing carbon emissions.

# China Sustainable Energy Program
# Low-Carbon Development Program Ongoing Projects

## Beijing Energy-Efficiency Center

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $100,000

***Description:*** To develop an integrated carbon emissions and energy demand model to demonstrate how energy efficiency and renewable energy can help China achieve its 2020 economic development goals.

## China Energy Research Society

**Grant Date:** 3/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To publish and distribute policy recommendations developed by China Sustainable Energy Program (CSEP) grantees to senior policy decisionmakers in the central and local governments.

## Development Research Center of the State Council

**Grant Date:** 8/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To submit policy recommendations developed by grantees in all program areas to the State Council and other senior government ministries.

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $40,000

***Description:*** To develop national tax and fiscal policies to promote clean energy technology investment.

## Energy Research Institute

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $30,000

***Description:*** To develop a model to assess the impact of national tax and fiscal policies designed to promote clean energy technology investment.

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To coordinate and oversee top energy institutions' development of national tax and fiscal policies designed to promote clean energy technology investment.

## Global Village of Beijing

**Grant Date:** 7/1/2005 **Duration:** One year **Amount:** $60,000

***Description:*** To continue to support media campaigns promoting key energy efficiency and renewable energy policy recommendations from each of the China Sustainable Energy Program's six program areas.

**Institute of Economic Research**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $45,000

***Description:*** To develop national tax and fiscal policies reforming energy pricing to promote clean energy technology investment.

**Institute of Investment Research**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To develop national tax and fiscal policies to promote clean energy technology investment.

**Lawrence Berkeley National Laboratory**

**Grant Date:** 5/1/2005 **Duration:** One year **Amount:** $100,000

***Description:*** To assist China's leading energy policy research institutes in developing medium- and long-term energy efficiency and renewable energy policy scenarios.

**Research Institute of Fiscal Science**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $55,000

***Description:*** To develop national tax and fiscal policies to promote clean energy technology investment.

**Shanghai Academy of Environmental Sciences**

**Grant Date:** 7/1/2005 **Duration:** One year **Amount:** $50,000

***Description:*** To support Shanghai's efforts to develop and implement a low-carbon policy action plan that encourages energy efficiency and renewable energy technology investment.

**Tsinghua University**

**Grant Date:** 1/1/2005 **Duration:** One year **Amount:** $30,000

***Description:*** To develop national tax and fiscal policies regulating the use of environmental levies to promote clean energy technology investment.

# China Sustainable Energy Program
# Low-Carbon Development Paths Program Project Updates

***Goal #1: Help China's develop "sustainable energy futures" scenarios anticipating the impact of today's policy decisions.***

**National Tax and Fiscal Policies for Clean Energy Development**

In a project led by China's Ministry of Finance (MOF) and National Development and Reform Commission (NDRC), ten of China's top energy policy research institutes are developing tax and fiscal policies to stimulate energy-efficiency and renewable-energy investment. If implemented, the policies they developed—the centerpiece of the November 16-17 *International Forum on Tax and Fiscal Policies to Promote Sustainable Energy Development*—could enable China to achieve the energy-efficiency goals set out in its the *National Energy Plan 2020*, which calls for China to quadruple GDP while only doubling energy use.

The project's policy recommendations focus on (1) reforming energy administrative institutions and building policy implementation capacity, (2) increasing government budgets to strengthen policy enforcement, (3) using taxes and environmental levies to internalize the environmental and social costs of fossil fuel combustion into electricity prices, (4) using incentive policies to encourage both public and private investment in energy efficiency and renewable energy, and (5) developing models evaluating the social impact of different tax and fiscal policies. Grantees have also completed analyses of energy policies in the buildings, industry, transportation, electric utilities, and renewable energy sectors.

**Recommendation**: When China transitioned to a market economy in the 1990s, it abandoned critical fiscal policies that had helped keep energy use in check. Pursuing its goal of quadrupling GDP by 2020, China should adopt tax and fiscal policies to accomplish the following:

- Increase public and private investment in demand-side energy-saving equipment;
- Reform electricity prices to internalize the environmental and social costs of electricity generation;
- Optimize environmental levies to create incentives for investment in energy efficiency and renewable-energy technologies; and
- Increase energy policy implementation and enforcement capacity.

**Low-Carbon Scenarios Analysis**

Scenario analysis is essential to maximize the effectiveness of energy policies; decision-makers need such analytic tools to anticipate the long-term impacts of today's policy decisions. CSEP has supported energy scenarios analysis since its inception. Most recently, several domestic and international policy research institutions—the Beijing Energy Efficiency Center (BECon), Lawrence Berkeley National Laboratory (LBNL), the Energy Research Institute (ERI), the Sustainable Development Center of the Chinese Academy of Social Sciences (CASS), the China Energy Research Society (CERS), and Tsinghua University—are working together to create

integrated "top-down" and "bottom-up" scenario models to project China's energy use and emissions over the next 25 years.

The team's analysis of energy consumption patterns in 2004, energy consumption forecasts for 2004 and 2005, and emissions forecasts for 2020 and 2030 were published China's *2004 Annual Energy Development Report*. Additionally, their initial findings and policy recommendations were submitted to NDRC and the State Council and have been widely cited by major Chinese newspapers, including the *China Daily*, *China Economic Times*, and *Economic Information Daily*. The team has now moved onto phase two of its project: they plan to (1) refine their scenario analysis model; (2) project the impact of both new policies and new enforcement procedures for current policies on future energy consumption and emissions levels; and (3) analyze energy consumption patterns over the past 3-5 years to identify the driving forces behind recent increases in energy intensity.

**Recommendations**:

- Scenario analyses have demonstrated energy-efficiency and renewable-energy technologies are more cost-effective than previously thought. It behooves China to set much more aggressive energy-efficiency and renewable-energy development targets.
- Scenario analyses have demonstrated that China wastes substantial amounts of energy. It is much cheaper—and more profitable—to reduce this energy waste than to build new supply. China should develop and require that local governments implement a National Energy Efficiency Action Plan to accelerate the adoption of energy-efficiency policies, reducing this energy waste.

**Local-Carbon Scenarios Analysis and Energy Intensity Reduction Targets in Beijing and Shanghai**

As the 2008 Olympics and 2010 World Expo draw nearer, the international community is becoming increasingly concerned about the air quality of these events' host cities, Beijing and Shanghai. Led by the Beijing Sustainable Development Center (BSDC) and the Shanghai Academy of Environmental Sciences, local teams are developing low-carbon scenario analysis models for Beijing and Shanghai. Local administrators can use these models to (1) set realistic carbon reduction targets and (2) choose the best energy policies for mitigating carbon emissions, clearing the air, and improving public health.

The State Council recently called for "the building of a resource-efficient society" and issued China's first *Medium- and Long-Term Plan for Energy Conservation*, which sets a target of lowering energy intensity by five percent each year. To reach this target, local governments must develop action plans to increase clean energy technology investment. Beijing and Shanghai, in particular, should develop both mandatory requirements and market-based incentives for promoting public and private investment in energy efficiency and renewable energy. Beijing and Shanghai are now considering such plans, which could serve as models for national replication.

**Recommendations**:

- Senior central government officials should help local governments set carbon emissions reduction targets in order to improve air quality and stimulate investment in energy efficient technologies.
- Senior officials should require all provinces and cities nationwide to develop *and implement* low-carbon energy technology development plans (emphasizing demand-side energy efficiency and renewable energy investment), building on the experience of Beijing and Shanghai.
- The Beijing and Shanghai municipal governments should implement regulations and incentives to catalyze investment in energy-efficient technologies. If successful, these regulations and incentives could become national exemplars.

***Goal #2: Help China develop and encourage China to adopt "all-in costs" pricing of fossil fuels.***

**Environmental and Public Health Impacts Study**

Including the public health and environmental costs of electricity generation into energy prices is an efficient and justified way to forward sustainable development. To better quantify the costs of fossil-fuel-fired power generation, grantees the Chinese Research Academy of Environmental Sciences (CRAES), ERI, and Beijing University created a model to analyze the environmental damage and public health effects it causes. Their model projects fossil fuel usage and air pollutant emissions by sector, region, and even individual enterprise under various policy scenarios, and then estimates the environmental and public health impact of these air pollutant emissions. Their final report will be submitted to the State Council, NDRC, MOF, the Ministry of Public Health (MOH), and the State Environmental Protection Administration (SEPA).

**Recommendation**: The State Council, NDRC, MOF, MOH, and SEPA should develop (1) stringent emissions standards and regulations and (2) implement policies that internalize the social and environmental costs of fossil-fuel-based power generation, thereby removing the false subsidy it is currently accorded. Taking these two measures will make energy-efficiency and renewable-energy technologies more cost-competitive and catalyze China's environmentally-sustainable development.

***Goal #3: Encourage China's State Council (cabinet) to issue energy efficiency and renewable energy policy directives to central, provincial, and local governmental entities in order to expedite policy development and implementation in all program areas.***

**Facilitating the Submission of Key Energy Policy Recommendations**

The State Council's Development Research Center (DRC) and State Council Research Office (SCRO) are working together to submit grantee energy efficiency and renewable energy policy recommendations to top national leaders and government ministries. Their efforts have strengthened grantee access to national leaders and built momentum for the adoption of several important grantee-developed policies.

Policy recommendations submitted to date include (1) vehicle fuel-efficiency and fuel-quality standards; (2) bus rapid transit development plans; (3) building energy-efficiency codes and implementation regulations; (4) industrial energy-efficiency standards and incentive policies; (5) a new national energy plan internalizing external costs, improving energy efficiency, and increasing renewable energy use; (6) plans for regional and provincial utility regulatory agencies; (7) a public benefits fund to support renewable energy development; and (8) mandatory market share policies to stimulate the installation of renewable energy facilities and purchase of the energy they generate. DRC and SCRO will continue submitting grantee policy recommendations to top national leaders and government ministries. They will also advise senior decision makers in the implementation of and work with government officials, grantees, and other stakeholders to further develop previously-submitted policies.

**Energy Policy Research Journal**

The China Energy Research Society (CERS) publishes a magazine, *Energy Policy Research*, which is distributed to senior energy decision makers and delivers recommendations of all grantees to high-level officials. Recently, energy efficiency and renewable energy policies recommended by several grantees, including motor vehicle fuel-efficiency standards, bus rapid transit system plans, building energy-efficiency requirements, Shanghai's energy plan, and urban sustainable energy development plans, as well as the results of carbon reduction scenarios, were published in the journal. In 2005, CERS also increased grantee access to decision makers through high-profile meetings and expanded outreach to government officials.

**Media Outreach**

Global Village of Beijing (GVB) is a non-governmental organization that coordinates workshops for Chinese journalists, creates television programs and publications, and hosts public forums to to increase public awareness of sustainable development. With our support, GVB held a series of media-education workshops advocating the implementation of China's *Renewable Energy Law*, energy-efficiency standards and energy labels for home appliances and industrial equipment, mandatory fuel-efficiency standards, and demand-side management programs. Workshop attendees included journalists from the government-affiliated *People's Daily, Guangming Daily*, and *Xinhua News Agency*.

**Recommendation**: China should inform the public that energy efficiency and renewable energy technology investment are essential to realize a sustainable energy future.