The China Sustainable Energy Program

中国可持续能源项目

Policy Recommendations

China Sustainable Energy Program
Tenth Senior Policy Advisory Council Meeting
China's 20-Percent Energy Efficiency Target

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I.

Integrating Transportation and Land Use Development in Building "Harmonious" Cities

China Sustainable Energy Program

Chinese cities are rapidly changing, absorbing the enormous growth in urban population by reforming master plans and transportation systems. In order to streamline and optimize the growth process, the Ministry of Construction (M)C) has taken the important step of emphasizing that decisions regarding urban planning and transportation—which are inextricably linked—should be coordinated. However, to date, the coordination process has exhibited the following shortcomings:

1. With regard to transportation, land use planning often fails to give adequate specificity and attention to constraints, leading to traffic congestion and wasted resources in the implementation process;
2. Land use plans do not adequately support public transit development. In many cases, consideration of transportation is limited to road networks;
3. The practice of coordinating urban planning and transportation has yet to be made systematic;
4. In urban micro-planning, there is insufficient coordination of public transit services and residential construction. Failure to relegate enough space for bus stops, for example, can reduce public transit.

International experiences indicate that integrated planning of land use, transportation, and construction can significantly reduce travel time and resource waste. Firstly, by pursuing transit-oriented development (TOD), smart urban planning puts workplaces, residences, and services in closer proximity, thereby reducing travel distances and the need for motorized travel. Fast, large-capacity public transit modes, particularly bus rapid transit (BRT), have proven effective at efficiently and comfortably transporting individuals between these mixed-use areas. In addition, planning that makes room for "green belts" and urban growth boundaries plus incentives for high-density, in-fill development within those boundaries can limit urban sprawl. These factors combine to reduce transportation-related energy consumption, and to further the sustainability of urbanization.

Thus, we offer the following recommendations:

(1) To maximize energy saving, MOC should formulate urban planning guidelines as soon as possible. For new cities and satellite cities in particular, the guidelines should emphasize the importance of urban planning based on eco-city criteria while taking the demands and constraints of transportation into full account.

(2) To increase the role of transportation in urban planning decisions, MOC and provincial planning departments at each level should establish incentives for pilot projects that feature coordinated development of land use and transportation, especially TOD.

(3) To increase the accessibility, service quality, and effectiveness of public transit, micro-planning for transportation must be more specific, and public transit must receive priority in infrastructure and community-construction considerations.

II.

Setting Strict Vehicle-Use Fuel Quality Standards to Decrease Transportation Pollution and Enable the Application of Clean Advanced Vehicle Technologies in China's Cities

The rapid expansion of China's vehicle fleet has elevated transportation-related energy consumption and environmental damage, with motor vehicles accounting for 50 percent of urban air pollution. According to the *Report on the State of the Environment in China,* issued by the State Environmental Protection Administration (SEPA), forty percent of China's cities fail to meet the National Grade II Air Quality Standard, due in large part to vehicle emissions of consumable particulate matter and nitric oxide. To control vehicular pollution, SEPA, along with the Standardization Administration of China, implemented the National Stage I, II, and III Standards in 2000, 2004, and 2007 respectively. Stage IV standards will be implemented in 2010.

While the implementation of these standards is an important step, their effect is reduced by the absence of correspondingly stringent **fuel quality standards**. Fuel standards address the root cause of motor emissions, especially when restricting sulfur content; concurrent adoption of fuel and emissions restrictions has proven effective in developed countries. In China, standards for oil products lag two to three years behind emissions standards, and are currently as follows: gasoline sulfur content must meet Euro II limits (500 ppm); Euro III limits (150 ppm) have been adopted in such cities as Beijing, Guangzhou, and Shenzhen, and will be required nationwide in 2010; diesel is required to meet the Euro I standard (2000 ppm); and there is currently no mandatory standard for vehicle-use diesel oil. Sulfur content levels required by the Euro emissions standards can be found in the following table.

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

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

According to experts in the scientific, environmental, and petrochemical industries, the restriction of sulfur content is critical to automobiles' ability to meet emissions regulations, and thus to mitigation of the overall effects of motor vehicle emissions. Joint research conducted by the International Council for Clean Transportation, the US Environmental Protection Agency, and Tsinghua University indicates that if the automobile emission standards are upgraded according to existing state regulations (i.e. sulfur content in oil products is held at Euro II), motor vehicle emissions standards will reduce particulate matter emissions by 280,000 tons by 2020. However, simultaneous adjustment of vehicle emissions and sulfur content standards can reduce particulate matter emissions by 380,000 tons in the same period. Furthermore, implementation will produce environmental benefits of nearly RMB 100 billion while costing RMB 20 billion, yielding a cost-effectiveness ratio of 1:5.[1]

[1] More important than cost-effectiveness analysis, however, is benefit-cost analysis, which in this case involves a comprehensive, "all-in" assessment of the net public and environmental benefits of low-sulfur fuel. Because sulfur causes serious public health costs, shifting to low-sulfur fuels as rapidly as possible would yield vastly greater benefits than is

Improving oil product quality will also make China's petrochemical industry more competitive, thereby helping the Chinese economy. Having joined WTO, China's domestic vehicle-use oil product market will gradually open to international oil companies, many of which have the ability to provide clean vehicle-use oil products in a short period (e.g., BP, Shell). As China's cities tighten emissions standards, domestic petrochemical enterprises must produce clean fuels to maintain market share. To spur enterprises to make technological upgrades, the government should carry out macro regulation through strict quality standards and regulations, and encourage enterprises to increase investment, improve technology and produce clean fuel.

In addition, clean fuels lay the foundation for the adoption of cleaner and more advanced vehicle technologies, thereby benefiting energy-saving efforts. For example, diesel–fueled passenger cars have higher fuel economy than comparable gasoline-fueled cars, but significantly higher particulate and NOx emissions; in fact, diesel exhaust is a banned carcinogen in both Hong Kong and Japan. Available after-treatment technologies to clean the exhaust require clean diesel oil.

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

(1) Develop, update, and implement strict fuel standards in step with emissions standards and establish a medium- and long-term fuel desulfurization plan.
Given the complexity of fuel-product production technologies, it will be a challenge for China to reach Europe's oil product standards. Nonetheless, developing more stringent sulfur content limits is necessary to spur refinery upgrades and effectively implement vehicle emissions standards, and should be undertaken immediately to allow manufacturers adequate time for adjustments. China should require that 150 ppm gasoline and 350 ppm diesel oil be required nationwide immediately. By 2010, fuels meeting Euro IV standards should be made available, and requirements for all fuels to meet Euro IV should be phased in. The long-term fuel desulfurization plan should include the use of sulfur-free (<10ppm) gasoline and diesel oil, which is equivalent to international best practice, and would open the door to China's development of advanced, clean vehicle technologies.

(2) Adopt economic incentives, such as preferential fuel pricing and tax systems to improve fuel quality.

Economic incentive policies can improve fuel quality while ensuring returns on enterprises' investment. For example, Germany has effectively implemented taxes to achieve a very high fuel quality standard, while Hong Kong has used taxes to lower fuel sulfur content from 1500 ppm to 50 ppm within a very short time period. China can adapt these experiences to formulate a preferential pricing and tax system to encourage the production and use of clean fuels. For example, analysis by Lawrence Berkeley National Laboratory indicates that a 8 fen-per-litter gasoline and diesel tax could pay for refinery upgrades that could deliver low-sulfur (under 15 ppm) gasoline and diesel nationwide.

(3) Establish government coordination **and strict implementation mechanisms to ensure standards' effectiveness.**

In China, implementation of fuel standards involves the National Development and Reform Commission (NDRC), the State Environmental Protection Administration (SEPA), the Standardization Administration of China (SAC), and industry groups. The effectiveness of implementation requires interdepartmental coordination, such that quality controls are exercised for fuel production, transportation, distribution and retail.

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revealed by cost-effectiveness analysis.

III.

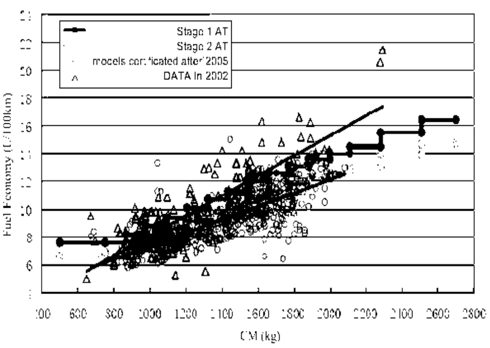
Establishing a Complete Vehicle Fuel Economy System, Updating Existing Standards Regularly, and Strictly Implementing All Standards

China has become the world's second largest new vehicle market and the third largest automobile producer, with 83.5 million motorcycles, 15 million rural vehicles, 13 million tractors, and 38 million passenger cars, buses, and trucks, totaling 150 million units. To ease the current account, energy, and environmental pressures brought about by this growth, China is adopting fuel economy standards to improve fuel efficiency. In 2004, the National Development and Reform Commission (NDRC) and the Standardization Administration of China (SAC) issued *Passenger Vehicle Fuel Consumption Limits*, China's first compulsory national standard for passenger vehicle fuel consumption, followed in 2007 by a standard for light-duty commercial vehicles (See below for enforcement dates).

Vehicle Category	Date Adopted	Model	Enforcement Dates	
			Phase I	Phase II
Passenger Vehicle	Oct. 2004	New	July 1, 2005	Jan. 1, 2008
		Prior Certification	July 1, 2006	Jan. 1, 2009
Light-Duty Commercial Vehicle	July 2007	New		Jan. 1, 2008
		Prior Certification	Jan. 1, 2009	Jan. 1, 2012

According to grantee analysis of NDRC's fuel economy data, the passenger vehicle standards have gained significant traction in the past few years. In 2003, only 50 percent and 12 percent of the 300 new passenger vehicle models met Phase I and II limits, respectively. By 2005, all 417 new models met the Phase I limits, and 76 percent met Phase II requirements. Furthermore, average fuel efficiency has improved (see table below). These data indicate that manufacturers' ability to meet fuel economy limits is higher than originally claimed, and that there is room for significant tightening of these standards.

No. of models	Phase I	Phase II
300 in 2003	~50%	~12%
417 new in 2005	100%	76.3%
845 models	84%	53%



Thus, we make the following recommendations to increase fuel efficiency and energy conservation in the transportation sector.

(1) Establish a complete system of vehicle fuel economy standards, especially one that includes a standard for heavy-duty trucks.

China has adopted fuel economy standards for passenger vehicles and light-duty commercial vehicles, and standards for motorcycles and rural vehicles are being developed. However, the government work plan currently omits heavy-duty trucks, which are the most significant vehicle consumer of diesel oil. We recommend that NDRC and SAC take the lead in establishing a work plan for adoption of fuel economy standards for heavy-duty trucks.

(2) Update existing fuel economy standards regularly, and begin developing Phase III and IV fuel economy limits for passenger vehicles.

Phase II limits for passenger vehicles will go into effect at the beginning of 2008. Based on the speed at which compliance with standards has increased, manufacturers have the ability to meet limits that are more stringent than those currently in place, which should therefore be adjusted. In addition, development of the next round of fuel economy limits (Phase III and IV) should begin as soon as possible. Doing so will allow time for the establishment of a robust regulation, informing of manufacturers, and manufacturers' preparations for compliance.

(3) Implement and rigorously enforce all fuel economy standards for domestically and internationally manufactured vehicles.

NDRC has implemented a production ban within China for those passenger vehicles failing to meet fuel economy standards. However, foreign vehicles sold in China—regulated by the Ministry of Commerce (MOC) and the General Administration of Quality Supervision, Inspection, and Quarantine (GAQSIQ)—remain exempt. To make China's energy-saving and pollutant-reducing efforts more complete and fair, we recommend that MOC and GAQSIQ hold these vehicles to the same standard as domestic cars.

In addition, we recommend that NDRC, the Ministry of Finance (MOF), and the State Administration of Taxation develop punitive and incentive market policies (e.g. preferential vehicle excise taxes and purchase tax rates) for vehicle models failing to reach Phase II limits, to be implemented as soon as possible.

(4) Establish a public information system for vehicle fuel economy

Knowledge of vehicle fuel efficiency is critical for informed consumer decision-making, which can shift the market in favor of cleaner and more efficient vehicles. Beginning last year, NDRC began to release vehicle fuel economy data, an important step. However, there is still no mechanism for periodic release of data, nor a fuel economy labeling system. We recommend that NDRC accelerate the development of a routine system for fuel economy data publication, and adopt and implement the fuel economy labeling system.

IV.

Strengthening Local Policies to Set and Implement Stringent Energy Efficiency Standards

China's booming economy is fueling corresponding increases in the energy consumption of buildings, appliances, and industry. Given the magnitude of growth, energy efficiency standards and codes have immense energy-saving potential, which China has recognized: after ten years' effort, a set of such standards have been set and implemented at the national level for various industries.

In the buildings sector, for instance, residential building energy efficiency codes for the "Hot Summer Cold Winter" (HSCW) and "Hot Summer Warm Winter" (HSWW) climate zones were issued in 1995, 2003, and 2005. In 2005, China issued and implemented energy efficiency codes for public buildings. For household appliances, there standards for refrigerators, air conditioners, fluorescent lamps, and televisions have been implemented. The absent or straggling standards are been formulating positively. Furthermore, China has formulated reach standards for key appliances, with which manufacturers will need to comply in two to three years.

While these national policies are ambitious in aim, there is dramatic regional disparity in the rate of implementation. While wealthy areas can reach nearly 100 percent compliance, implementation in poorer areas can be as low as ten percent, due to (1) absence of supporting policies for implementation, supervision and incentive policies, the formulation of which is the responsibility of local government; and (2) differences in implementation capacity stemming from economic resources and climatic conditions.

Thus, we recommend that the central government strengthen support to local governments with better condition to set higher standard or apply reach standards ahead of schedule. Hope new energy conservation law would push forward in this area.

Specifically, we suggest the following:

1. Central and local governments should improve the implementation polices and supervision systems that support the national standards, in order to ensure the impact of energy efficiency standards and codes.
2. Formulation of incentive polices at the central and local level, and promotion of high-efficiency product development, should be accelerated.
3. The central government should set up policies to encourage local governments with adequate capacity to set reach standards.

The central government should increase investment in capacity-building for reach standards implementation, including technical support and training for implementing agencies.

V.

Further Promote Efficiency Power Plants to Support the State's Energy-Saving Goals

I. The Efficiency Power Plant Concept

An Efficiency Power Plant (EPP) is a bundle of energy-savings from a particular region, industry or enterprise, "built" from the power demand reductions created by the use of high-efficiency electric appliances and products, the optimization of power consumption methods, and other such measures. EPPs serve the demand for capacity and energy, while saving energy and reducing emissions.

(1) Comparison of EPP and CPP

"Conventional Power Plant" (CPP) generally refers to a thermal power plant with installation capacity of 300 MW, operating 5,000 hours per year. The table below shows key differences between CPPs and EPPs.

Table 1 Comparison of fuel consumption, pollutant emission and cost/kWh of CPP and EPP

	CPP	EPP
Installation capacity	300MW	300MW
Electricity produced/saved per year	1.5 billion kWh	1.5 billion kWh
Fuel consumption per kWh	340 grams coal equivalent (gce)	0 grams coal
SO_2 emissions per kWh	4 grams	0 gram
Average cost per kWh	0.35- 0.40 Yuan	0.15 Yuan

Like CPPs, EPPs undergo planning, financing, construction, operation, and verification and evaluation of performance (i.e. power produced or saved). An EPP can also use the same financing and cost-recovery measures, given the proper set-up and policy framework. For a CPP plant, capital and operation costs are recovered through power generation; for an EPP, these costs are recovered through the sale of energy savings.

(2) EPPs and Demand Side Management

Demand Side Management (DSM) refers to the measures funded and implemented by power companies and other entities to improve end-use power consumption efficiency or load management. EPP and DSM have many shared characteristics, though DSM projects in China tend to focus on load management. The key differences are in integration, financing, and cost-recovery mechanisms:

- An EPP consists of a bundle of integrated DSM solutions. This method of integration has not only made large-scale, low-cost external financing possible, but also reduces financial risk and management and transaction costs.
- Energy-saving mechanisms are integrated to form EPP units, which enter the power market. The market can be designed to ensure that EPPs are competitive with CPPs in satisfying the needs of consumers.

- EPPs integrate individual DSM projects, thus allowing energy and capacity savings to be considered on a specific scale, and simplifying the comparison of supply side and demand side solutions. This gives the decision-maker a deeper understanding of the role and benefits of energy efficiency, which helps to improve planning and investment procedures in China.
- Cost recovery for current DSM projects varies by case. EPPs allow cost-rocovery methods to be simple and well-designed, with repayments for EPP projects also made in installments, as is the case for amortization of CPP costs.

II. EPP Implementation Modes

The following are the main implementation schemes for EPPs:

(1) Mode 1: Comprehensive integration of EPPs and power sector reform

This is the most comprehensive and effective mode for EPP implementation: it prioritizes energy-saving, puts the power produced through savings and generation on equal footing, and accommodates utilities' profit motive and national energy-saving objectives. Under this scheme, power companies are obligated to use the lowest-cost method of providing energy. Since the cost of implementing energy-saving is much lower than that of supply, this mode can considerably improve the use of EPPs, especially when combined with power pricing reforms that allow equivalent treatment of the financial costs of CPPs and EPPs. Unfortunately, the current system provides for cost-recovery for CPPs, but not for EPPs.

Mode 1 best integrates energy-saving with power sector reform, and is the scheme most strongly recommended by the International Energy Agency (IEA) due to its capacity to create synergies between the power sector and DSM to save energy. An example of this mode is the system in place in California.

(2) Mode 2: System Benefit Charge (SBC)

System Benefit Charges (SBCs) are small surcharges added to electricity bills. The main differences between modes 1 and 2 are the following:

First, the role of the grid company is much weaker in mode 2, limited to collecting capital for EPP financing.

Second, modes 1 and 2 vary in the way in which EPP costs are incorporated in electricity prices. In mode 1, with adjustment of the electricity price, in addition to recover EPP related costs, both the consumers and developers can invest on the energy-saving projects. In mode 2, EPP costs are covered through small added charges on to power producers or consumers, with estimation of EPP scale and costs; however, it is difficult for SBCs to cover all economically practical EPPs as the available SBC is always limited. This mode has been widely adopted in many US states and in other countries.

(3) Mode 3: Government financing

The main difference between modes 2 and 3 is that the source of capital in mode 3 is the government. Funds can be drawn from existing revenue sources, or new taxes encouraging energy saving (e.g. energy tax, pollution levy).

(4) Mode 4: Financial contributions from participating consumers

Mode 4 combines EPP with conventional loans or ESCOs, whereby consumers choosing to invest in energy-saving projects can recover investment costs over a period of time.

In summary, these implementation modes share the following features:

- Each can determine and evaluate potential energy-savings, choose between various energy-saving solutions, and integrate these mechanisms into an EPP of considerable scale (approximately 300 MW).
- Investment in energy-saving projects is clear and well-defined, and loans or other capital resources are held by responsible, competent and credible entities, which can monitor the design and delivery of energy-saving projects and manage loan repayment procedures.
- Energy-saving projects are carried out jointly by the energy services company (ESCO), consumers, contractors, and other parties, under proper supervision.
- Actual energy-saving performance is evaluated and verified by one or more governmental agencies.
- The loan is repaid within the lifetime of the energy-saving investment project.
- Projects must be approved by the government, which then supervises the project's progress from start to finish.

The differences between these four implementation modes lie in the method of financing, role of the grid company, and the extent of integration with power sector reform. All modes can be feasible and effective, but they also generally require the support of additional national policy reforms.

While EPP promotion ultimately requires national-level action, provincial policies can considerably improve implementation of each mode. Recently, Shandong implemented an energy consumption quota system involving 20 industries and 52 product categories produced in the province, with energy consumption quota (for electricity and fuels) formulated by the provincial government. Consumers exceeding quotas are required to pay additional expenditures of up to three times the price of energy, a sum that is transferred to government financial departments and used mainly for energy-saving endeavors. Other provinces, including Guangdong Province, are now formulating similar energy consumption quota systems, which can be combined with EPPs to create synergies between the power sector, environment, EPP participants, and other consumers. The quota system establishes a practical energy-saving goal with financial incentives and disincentives to encourage participation in EPPs, thereby achieving energy savings and establishing revenue flows to support energy efficiency investment.

III. Policy recommendation on support for Efficiency Power Plant (EPP) implementation

EPPs can significantly contribute to the realization of China's energy-saving goal of the 11th Five-Year Plan. For the state and provinces, the recommended key measures that must be undertaken to support EPP implementation in the near future as follows:

- Central government policies should be reformed to support EPP . To ensure the needed priority within policy changes, the EPP concept and its related measures should be incorporated into the *Energy Conservation Law, Electricity Law, and Energy Law* of China.

- EPP should be regarded as a resource that is at least the equivalent of CPP. In addition to capital raised from participating consumers, EPPs need a stable and sufficient capital source, either from central tax revenue, urban construction tax, charges from energy consumption quotas, or other channels. China should set up a special fund to support EPP implementation in the electric power industry, i.e. from a specified ration of electricity prices.
- Further electricity price reform. The experiences from China and other countries indicate that the consumers do change their energy consumption in response to price. Key changes would include such measures as block tariffs or higher electricity charges for inefficient technologies.
- It is necessary for China to incorporate EPP into the market structure of the electric power sector. There is now widespread international recognition of an essential lesson from the California power crisis, which is that a fully competitive electric power market must allow the full participation of demand-side savings in the market.
- The financial obstacles to grid company investment in EPP must be eliminated, through adoption of a cost-recovery mechanism that encourages grid companies investment in low-cost EPPs. In the medium-term, revenue caps should be adopted so that grid companies' revenues are decoupled from electricity sales.

It is particularly recommended that all localities should integrate energy consumption quota system with EPP, with the quota set such that a majority of consumers (excluding the most efficient consumers) must pay additional charges to support EPP construction. An example of a charge scheme is as follows: 10 percent additional charge for consuming 10 percent above quota; 20 percent charge for being 10 to 20 percent above quota, and so on. The revenues from these charges should be used to raise capital for EPPs and thus reduce the financial burdens of participating consumers. This scheme can provide strong incentives to stimulate consumers' participation in EPP projects.