www.SETatWork.eu

Country Profile for Zhejiang Province of CHINA

Prepared by: *Zhejiang Energy Research Institute of China (ZERI)*

Prepared: *September 2009*

Published: *October 2009*

Contents

SETatWork is supported by the European Commission under the Seventh Framework Programme (FP7). This publication reflects the author's views. Although the author's best efforts have been made to ensure that the information contained herein is accurate, neither the European Commission, the SETatWork Project Members nor the author are liable for any use that may be made of the information contained herein.

1. Introduction

This report is one of a set of Country Profiles produced by **SETatWork**. The global society is faced with a huge challenge in order to meet the threat given by global warming. The project **SETatWork - Sustainable Energy Technologies at Work** aims to meet this challenge through the collaboration and partnerships between organisations in EU, Asia and South America, supported by the EU's Seventh Framework Programme (FP7). The activities take place over two years from 1 September 2008 to 31 August 2010.

The aim of this country profile, is to provide an overview of the carbon market in the Zhejiang Province of China with a focus on RTD needs, implementation options and perspectives associated with energy efficiency and savings in the carbon market (short term and medium-long term).

The main target groups for this country profile are companies (financial investors, project developers, technology providers, ESCOs, consultants, etc.), organisations and administrations that are interested in a short overview of relevant information in the development of carbon projects and markets in the Zhejiang Province of China. This information may also be of relevance to readers from other countries that are interested in an overview of the Zhejiang Province of China as well as for national readers that need to have information on their national developments.

SETatWork Country Profiles can be found online at: http://www.setatwork.eu/countries.htm

2. General Country Overview

During the past three decades, China economy has experienced rapid growth. According to the statistics, gross domestic product (GDP) of China was 24952.99 billion yuan (approx. 2496 billion Euro) in 2007, its annual average growth rate was 9.8 % during the period of 1979-2007.

Accompanied with this development of society and economy, total primary energy consumption in China has increased to 2655.83 million tce (i.e.1859 million toe) in 2007, at annual average growth rate of 5.44% during period of 1979-2007.

By fuels, coal consumption accounted for 69.5% of total one in 2007, oil 19.7%, natural gas 3.5%, and the rest 7.3% (including hydro, nuclear and wind power). It is indicated that coal is dominant in Chinese energy mix, will be still for some long term.

By industries, energy consumption in the primary industry accounted for 3.1%, 73.1% in the secondary one, and 13.7% in the tertiary one, as well as 10.1% for residential use. It is clear that there are great potentials for energy saving in industrial sectors. Furthermore, the energy consumption in energy intensive industrial sectors were listed in Table 1, including metallurgy, cement, power, chemical industry, petroleum, textile and paper making etc.

In this paper, Zhejiang province, which is one of the most rapid growth areas in China, is taken consideration into energy efficiency and saving as well as CO_2 emission reduction.

Table 1 *Energy Consumption in energy intensive sectors of China (2007)*

sectors	energy consumption	Share (%)
textile	6207.57	2.34%
paper making	3342.68	1.26%
oil refinery	13176.51	4.96%
chemical products	27245.27	10.26%
Non metal mineral products	20354.84	7.66%
ferrous metallurgy	47774.37	17.99%
non-ferrous metallargy	10686.37	4.02%
metal product	2832.47	1.07%
power and thermal generation	18474.59	6.96%

2.1 Countermeasures for climate change

In June 2007, the State Council of China publicized the *China's National Climate Change Program* (hereafter referred to as the *National Program*). The *National Program* reviewed the climate change situation and the everlasting fight against climate change in China, analyzed impacts and challenges upon China caused by climate change, put forward the guidelines, objectives and related policies and measures to fight climate change, and explicated China's basic stand point and international cooperation demand with respect to climate change. The *National Program* explicitly declared that "energy efficiency and energy saving should be encouraged", "GHG emissions should be controlled", "further international cooperation with respect to climate change should be strengthened, and cooperation in CDM and technology transfer should be promoted, and China will face the challenges of climate change hand in hand with the international society".

In October 2008, the Press Office of the State Council publicized the White Paper — *Climate Change Policies and Actions by the Chinese Government*. The White Paper gave comprehensive introduction to the impact climate change has upon China, China's climate change mitigation and adaptation policies and actions, and institutional and policy establishment by the Chinese government. The Chinese government vigorously promotes policies and actions to mitigate climate change, and has already adopted a series of measures including adjusting economic structure, changing developing mode, saving energy, improving energy efficiency, optimizing energy structure, reforestation and etc. The Chinese government attaches great importance to the role of CDM in sustainable development of China, and is willing to contribute to the international endeavour of reducing GHG emission though CDM projects. The Chinese government also promulgated and publicized the Measures for Operation and Management of CDM Projects.

In July 2007, the Zhejiang Provincial Government established the *Steering Committee for Climate Change, Energy Saving and Emission Reduction*. In October 2008, the compiling of the *Action Plan to Cope with Climate Change in Zhejiang* was initiated. This Action Plan set the major targets, basic principles, key areas and policies measures to cope with climate change in the short terms for Zhejiang Province, which has provided the foundation for strengthening the efforts against climate change in Zhejiang Province.

In 2009, the Zhejiang Economic and Trade Commission, jointly with other governmental administrations, issued the *Notification on the Resources Conservation and Environmental Protection Action Plan in 2009* , setting the energy saving targets for Zhejiang Province and putting forward ten key energy saving projects, including:

1) 1000 key industrial enterprises energy saving promotion project. Until 2012, energy consumption per unit of added industrial value would be reduced 20% compared with that of 2007, saving 15 million tons of coal equivalent, with annual saving to be 3.16 million tons of coal equivalent.
2) Phasing out backward production capacities. Until 2012, small coal-fired power plants, small scale cement plants, small scale metallurgical plants, and small scale pulp plants would all be shut down, saving 1.4 million tons of coal equivalent of energy altogether.
3) Renovating traditional industries. Until 2012, the traditional industrial products would be of higher end, and have higher added value and be added more competitive edge. This project would save 3.1 million tons of coal equivalent of energy.
4) Revitalizing equipment manufacturing industry. Until 2012, the growing rate of the added value of the equipment manufacturing industry would be at least three percentage points higher than the average industry growth rate, with average annual growth rate of more than 15%, saving 3.5 million tons of coal equivalent of energy.
5) Promoting technology renovation. Until 2012, the total output of the high-tech industry would reach as high as 15 trillion Yuan, with an annual growth rate of 23%, saving 1.3 million tons of coal equivalent of energy.
6) Promoting Building energy saving. Until 2012, it would be mandatory for all new residential buildings to following the 65% energy saving target and 5% or more renewable energy consumption target in Zhejiang Province. All governmental office buildings and large public building with floor area larger than 10000 m2 should be equipped with energy consumption monitoring system. Renewable energy would be more widely used in buildings, among which the solar water system and integrated building design would cover no less than 100 million m2 of buildings, saving 3.5 million tons of coal equivalent of energy as a result.
7) Promoting transport energy saving. compared with those of 2007, until 2012, the unit energy consumption for commercial vehicles will fall 5%, oil consumption per ton·km for inland vessel transportation would be reduced by 8%, saving 2.5 million tons of coal equivalent of energy.
8) Promoting energy saving in commercial and domestic sectors. Until 2012, key energy consuming commercial entities would cut their energy consumption by 20%, saving 0.3 million tons of coal equivalent of energy.
9) Promoting energy saving at public institutions. Until 2012, public institutions would cut their energy consumption by 20%, among which public administrations, schools or hospitals with annual electricity consumption greater than 3000MWh would save 0.2 million tons of coal equivalent of energy.
10) Promoting comprehensive utilization of resources. Until 2012, the rate of comprehensive utilization of industrial solid waste would reach 94%, and water usage per 10000 RMB would be reduced to 60 tons, saving 1.6 million tons of coal equivalent of energy.

The ten projects mentioned above have showed major directions for energy saving and emission reduction in Zhejiang Province and have set clear targets.

2.2 Energy consumption in Zhejiang Province

Though very developed in economy compared with other regions in China, Zhejiang Province is short of energy sources with basically no oil and few coal reserves. Of all energy consumed in Zhejiang, 96% are imported from outside the province.

With fast economic and social development of Zhejiang, and the accelerating speed of industrialization, urbanization and modernization, energy consumption in Zhejiang is growing at astonishing speed. In 2007, total energy consumption in Zhejiang Province reached 145.33 million tons of coal equivalent. Average annual growth rate of energy consumption in Zhejiang was 9.9% through 1997 to 2007.

In 2007, total coal, oil products and natural gas consumption in Zhejiang were 130 million tons, 19.77 million tons and 1.81 billion m3 respectively, and electricity produced from hydro, nuclear and wind accounted was 35.7 billion kWh. Coal still dominated energy consumption in Zhejiang, accounting for 64.1% in the energy consumption mix, with oil products accounting for 21.6%, and natural gas 1.5%.

In 2007, the first industry, the secondary industry and the tertiary industry each consumed 3.53 million, 109.55 million and 19.6 million tons of coal equivalent of energy, accounting for 2.4%, 75.4% and 13.5% of total prime energy consumption.

3. Energy Consumption and Energy Efficiency by sector

Energy consumption per unit of GDP of Zhejiang Province in 2007 was the third lowest in China, i.e. about 0.83 tons of coal equivalent of energy per 10000 Yuan (at comparable price in 2005). Similar as regions in China and as other countries, the major energy consuming sectors in Zhejiang are industry, buildings and transportation.

In the industrial sector, energy are largely consumed by energy intensive, heat consuming industries like metallurgy, chemical industry, paper industry, textile industry and chemical fiber industry. According to statistics, total energy consumption of the above industries of Zhejiang in 2004 accounted for 58% of total industrial energy consumption. Processing heat has been the major energy demand for these industries.

Building energy consumption in Zhejiang each year is about 20 million tons of coal equivalent, nearly 30% of total end-use energy consumption of Zhejiang. Zhejiang is located on the hot-summer cold-winter region, where little attention has been put on insulation designs of buildings and as a result 95% or more of the existing building are non-energy efficient ones. In the long hot summer and cold winter times large amount of energy, of which mostly is electricity, are consumed due to cooling and heating purposes.

Transportation consumes about 20% of total end-use energy in Zhejiang. Many aspect such as fuel economy of vehicles, convenience of public transportation, organizing of transportation, and awareness of transportation energy efficiency still need to be improved for a more energy-efficient transportation system in Zhejiang Province. The amount of vehicles in Zhejiang is growing at an astonishing speed, causing huge demand for oil products. Hence, transportation energy saving is vital for cutting energy consumption in Zhejiang as well as for energy security.

3.1 Industrial energy efficiency

In 2007, energy consumption per unit of product in key energy intensive industries, such as power generation, construction materials, textile printing, petrochemical industries keep decreasing. Of the 34 key energy intensive products that altogether account for over 45% of total energy consumption in Zhejiang, more than 90% products had lower per unit product energy consumption than that of the previous year. More than 1/3 of industrial products, including those from refinery, cement and synthetic ammonia industries have the lowest or close to the lowest per unit energy consumption in China, with some even close to the international advanced level. The coal consumption for fuel-fired power generation and cogeneration keep falling for years, steel smelting electricity consumption was reduced by 53kWh/t in 2006 compared with the previous year. Unit product energy consumption of cement industry and small-scale ammonia industry are among the lowest of all provinces and regions in China. It was estimated that the energy consumption reduction of 30 key energy-intensive industrial products in Zhejiang led to an annual energy saving of 2.7 million tons of coal equivalent.

Setting standards is prerequisite for effective energy saving. In June 2007, the Zhejiang Provincial Government issued provincial standards for energy saving. For energy intensives industries, up-limits for per unit product energy consumption were set, in order to rein in the overheating energy intensive industries. The energy consumption limits relate to fuel-fired power generation, cogeneration, cement industry, refinery and caustic soda industry, involving 370 enterprises from 4 industrial sectors that accounted for about 30% of total energy consumption and about 50% of total industrial energy consumption in Zhejiang.

3.1.1 Energy consumption limit for cogeneration

① global heat efficiency

> 45% (Built before or in 2008) ; ≥55% (Built after 2008)

② consumption of coal equivalent per unit of heat produced

≤42.9 kgce/GJ (Built before or in 2008) ; ≤40.5 kgce/GJ (built after 2008)

③ consumption of coal equivalent per unit of electricity supplied

≤445 gce/kWh (Built before or in 2008) ; ≤405 gce/kWh (built after 2008)

3.1.2 Energy consumption limit for refinery

Table 1 *Energy consumption limit for refinery*

Industrial scale	tce/ tons of petroleum of other raw materials
Refinery and processing capacity larger than 10 million tons/year	0.086
Refinery and processing capacity between million tons/year 5 ~ 10 million tons/year	0.095
Refinery and processing capacity below 5 million tons/year	0.120

3.1.3 Limit for coal consumption per unit electricity supplied for fuel-fired power plants

Upper limit for coal consumption per unit of electricity supplied = bechmark coal consumption per unit of electricity supplied × adjusting coefficient, that is,

$$B = K \times B_J$$

Where,

B——upper limit for coal consumption per unit of electricity supplied

B_J——benchmark coal consumption per unit of electricity supplied (see table ?)

K——adjusting coefficient, $K = 1 + K_L \times (0.85-X)$

Where,

$K_L$is the load adjusting coefficient, X is the load factor

$K_L = 0$, when $X > 0.85$;

$K_L = 0.20$, when $0.85 \geq X > 0.70$;

$K_L = 0.25$, $0.70 \geq X > 0.60$;

$K_L = 0.30$, $0.60 \geq X$

Table 2 benchmark coal consumption per unit of electricity supplied

Generation unit	Coal consumption per unit of electricity supplied (with no desulfurization) (g/kWh)	Coal consumption per unit of electricity supplied (with no desulfurization) (g/kWh)
100 MW level (100MW-115MW)	378	385
125 MW level (120MW-160MW)	359	366
200 MW level (200MW-250MW)	348	355
300 MW level domestic made (300MW-350MW)	334	339
300 MW level imported (300MW-350MW)	325	330
600 MW level and above (domestic made, sub-critical)	326	331
600 MW level and above (imported, sub-critical)	323	328
600 MW level and above (super-critical)	319	324
1000 MW level and above (Ultra super-critical)	308	313

3.1.4 Upper limit for cement products

Upper limit for cement products of existing cement plants Unit energy consumption (electricity consumption) of exsiting cement and cement clinker plants should follow the standards listed in table 3:

Table 3 *Upper limit for cement products of existing cement plants*

capacity	Comparable coal consumption of cement clinker (kgce/t)	Comparable electricity consumption of cement clinker [a] kWh/t	Comparable electricity consumption of cement [b] kWh/t	Comparable energy consumption of cement clinker kgce/t	Comparable energy consumption of cement kgce/t
>=4000t/d	<120	<68	<105	<128	<105
2000 ~ 4000t/d (incl. 2000t/d)	<124	≤72	≤109	≤133	≤108
<2000t/d	≤128	≤74	≤113	≤137	≤112
Cement grinding plants	-	-	≤43	-	-
a for cement grinding plants only b for cement plants including cement grinding plants					

Upper limit for cement products of newly built cement plant Unit energy consumption (electricity consumption) of newly built cement and cement clinker plants should follow the standards listed in table 4:

Table 4 Upper limit for cement products of newly built cement plants

capacity	Comparable coal consumption of cement clinker (kgce/t)	Comparable electricity consumption of cement clinker [a] kWh/t	Comparable electricity consumption of cement [b] kWh/t	Comparable energy consumption of cement clinker kgce/t	Comparable energy consumption of cement kgce/t
>=4000t/d	≤108	≤60	≤88	≤116	≤94
2000 ~ 4000t/d (incl. 2000t/d)	≤113	≤63	≤91	≤121	≤98
cement grinding plants	-	-	≤36	-	-
a for cement grinding plants only b for cement plants including cement grinding plants					

3.1.5 Upper limit for energy and alternative electricity consumption per unit of caustic soda products

Energy consumption of caustic soda includes comprehensive energy consumption and electrolysis alternative electricity consumption. Unit energy consumption (electricity consumption) of caustic soda production should follow the standards listed in table 5:

Table 5 *Upper limit for caustic soda products*

product categorized by mass factor (%)	up limit for comprehensive energy consumption (kgce/t)	up limit for electrolysis alternative electricity consumption (kWh/t)
ionic membrane method liquid caustic soda≥30.0	≤470	≤2400
ionic membrane method liquid caustic soda≥45.0	≤570	
ionic membrane method solid caustic soda ≥98.5	≤890	≤2400
membrane method liquid caustic soda≥30.0	≤935	≤2400
membrane method liquid caustic soda≥42.0	≤1080	
membrane method solid caustic soda≥96.0	≤1300	
Note 1: the up limit for comprehensive energy consumption increases 2.5kgce/t with every 1% concentration increase of the liquid caustic soda in the ionic membrane method. Note 2: the energy consumption and alternative electricity consumption in the table are the average values of accumulated values each year.		

In 2007, Zhejiang Provincial Government stipulated energy consumption limits for 19 key energy-intensive industries. It is intended that during 2008 to 2010, energy consumption limits for 23 products in the industrial and information sector will be set up gradually.

3.2 Energy efficiency in the building sector

The yearly energy consumption in the building sector now exceeds 20 million tons of coal equivalent, nearly 30% of total end-use energy consumption in Zhejiang. Energy saving design for buildings has seldom been taken seriously and as a result the energy consumptions are huge considering the poor living comfort of existing buildings.

Zhejiang has hot summer and cold winter, each lasting about four months during the year. Since during the planned economy period the province was excluded from the centralized-heating zone, now most of the existing buildings rely on electrical air conditioners for heating and cooling. With the development of economy and living standards, the number of air conditioners and electrical heaters are soaring up. In 2007, every 100 families in cities and towns owed 61 air conditioners and in suburban areas 54, while in 2001 the numbers were 71 and 10 respectively. During heating and cooling seasons, energy consumption for air conditioning can account for 50% of total building energy consumption, which creates high peak electricity demand in hot summer times. According to related research project, compared with non-energy efficient buildings, energy-efficient demonstration buildings in Zhejiang consume 1/3 – 1/2 less energy.

Artificial lighting is also important in building energy consumption, accounting for about 20% of total building energy consumption. Now in the market the energy efficient bulbs still costs several times higher than non-efficient ones and part of the products in the market are of poor quality. Because of the above reasons, the incandescent bulbs still dominate the lighting market.

3.3 Energy efficiency in the transportation sector

Road transportation accounts for most of the diesel and petroleum consumption in Zhejiang Province. It is also the major source of pollution emission and is the key target area for reducing transportation energy.

The current obstacles to a more energy efficient transportation system, in Zhejiang as well as in most regions in China, are:

- fuel economy of vehicles is generally low. Statistics show that fuel consumption per 100km ride are almost 20% higher than that in developed countries, and for lorries the difference can be as high as 50%;
- poor maintenance of vehicles;
- poor awareness of transportation energy saving;
- low transportation efficiency, poor transportation organization, leading to low utilization efficiency of vehicles;
- the transportation system need further improvement.

In conclusion, there are two keys to transportation energy saving: energy efficiency of vehicles and efficiency of the transportation system, especially public transportation and rail transportation.

4. Legislation and policy

Legislations and policies related to energy saving and emission reduction in Zhejiang are:

- *Measures for implementing the 'China Energy Saving Law' in Zhejiang Province*
- *Implementing scheme for energy saving and energy consumption reduction in Zhejiang Province*
- *Implementing scheme for comprehensive work on energy saving and emission reduction in Zhejiang Province*
- *Implementing scheme for evaluation and appraisal of fulfilment of energy saving objectives in Zhejiang Province*
- *Guiding catalogue for promoting energy saving technologies and products*
- *Implementing measures for 'Proposal on strengthening electricity saving'*
- *Measures for identification of enterprises that apply the differentiated electricity tariff policy*
- *Provisions for comprehensive resources utilization in Zhejiang Province*
- *Management measures for building energy saving in Zhejiang Province*
- *Guideline proposals for energy saving and energy consumption reduction for cement industry in Zhejiang Province*
- *Guideline proposals for energy saving and energy consumption reduction for petro-chemical industry in Zhejiang Province*
- *Guideline proposals for improving and strengthening financial support for energy saving and emission reduction*
- *Action plan for resource conservation and environmental protection*

5. CDM opportunities

5.1 current status and existing problems

1. Enthusiastic participation and preliminary achievements have been made. A number of enterprises have applied for CDM projects or explored CDM opportunities in Zhejiang Province and now a good start has been made. Until November 20, 2007, 5 out of 133 Chinese CDM projects that had registered at the CDM Executive Board were from Zhejiang Province, and of the 26 CDM projects in China that had been issued CERs, 3 were from Zhejiang, which are Zhejiang Juhua Group Company Limited, Zhejiang Dongyang Chemical Company Limited and Linhai Limin Chemical Company limited. The total issued CERs were 6757124 tons of CO2e, accounting for 28.9% of total CERs issued to China.
2. Too few projects in the pipeline. Of all CDM projects (around 900) approved by the State Development and Reform Commission as of China as of November 2007, only about 2% projects came from Zhejiang Province, and among which the total estimated project emission reduction was only about 10 million tons of CO2e if not counting in the HFC projects. Projects mainly include natural gas power plant, heat recovery for power generation, wind power and hydro power projects.
3. Lack of awareness. Most project owners have little knowledge about CDM. The existing projects are largely initiated by the consulting agencies.

5.2 CDM opportunity

Current CDM from Zhejiang Province are from three sectors: the heavy industry and chemical industry, the conventional power generation industry and the renewable energy industry. Now projects that have greater emission reduction and clear additionality, including the renewable power generation projects, heat recovery for power generation in cement industry and natural gas-fueled power generation projects, have largely been developed so not much potential is left in these sectors. But, energy efficiency projects are still new and ready to be explored.

Currently in China, as well as in Zhejiang Province, The major reason why most projects are from the renewable energy sector and only a small part are energy efficiency project is that energy efficiency projects involve retrofit of existing production process, which is far more complicated than renewable energy projects in terms of CDM project development. At present, there are only two energy efficiency CDM projects popular in the Chinese CDM market, that is, the Dry Quenching projects for steel companies and heat recovery power generation for cement industry. Another problem hinders the development of energy efficiency CDM projects is that it is hard to decide the amount of emission reduction of retrofitting projects. At the current Chinese carbon market, the carbon buyers are mostly carbon trade brokers, while retrofitting design and CERs audit require cooperation with professional technical entities. With the resource conditions and industrial characteristics in mind, CDM potential in Zhejiang Province mainly exist in the energy efficiency sector, but project development faces great uncertainties considering the above obstacles.

5.2.1 New and renewable energy projects

- **Hydropower**. Zhejiang Province has abundant hydropower resource. Until end of 2008, 3192 small hydro power stations hadbeen built up, with total installed capacity of 3424MW and annual electricity generation of 7 billion kWh. Until now, 7 small hydro

power stations have applied as CDM projects, but the projects are generally small and their emission reduction altogether is estimated to be 300 000 tons of CO2e annually.

- **Biogas**. Parts of Zhejiang has very developed farming industry, where manures can be used to produce biogas to reduce GHG emission and at the same time decreasing air, water and soil pollution. To achieve this, large scale farming is suggested to facilitate CDM project development.
- **Natural gas-fueled power generation and wind power generation**. These are preferential CDM sectors and there are now 6 projects in the CDM pipeline at present, with total estimated CERs to be 4.57 million tons of CO2e. Zhejiang has poor inland wind resource, but offshore wind resource is abundant and is expected to be developed in large scale in the future.
- **Biomass energy development projects**. This is no such project in Zhejiang up to now. Biofuel and biomass power generation are both eligible CDM project sectors. This is a potential CDM sector for Zhejiang Province which has rich biomass resource.

5.2.2 Energy efficiency projects

- **Heat recovery projects**. One key technology is the low-temperature heat recovery for power generation from PC kilns of the cement industry, which has mature technique, short construction period, simple CDM PIN design process, simple baseline setting, emission reduction estimation and monitoring. These projects have shorter and easier validation and approval process and can get CDM revenue in shorter period, therefore it is favored by all parties involved. For example, one 5000t/d PC kiln equipped with 8000kW low-temperature heat recovery for power generation can produce 35000 – 40000tons of CO2e. If taken the price of 1 CER as 7.5$, 2.4 million RMB would add to annual profit of the enterprise. And for big cement enterprise that have several 2500t/d—10000t/d PC kilns, bundled projects that are implemented in several phases with 1-3 years would offer bigger CERs for trading while smaller trading cost, which is recommend by the CDM EB.

  Zhejiang Province has one of the best developed cement industry in China. Until now two cement companies have applied for CDM projects. Energy efficiency of cement industry in Zhejiang has already been improved to a national high level. And until the end of 2006, 29 of the 85 dry process cement production line had been equipped with low-temperature heat recovery power generation unit, with a total installed capacity of 203MW, which saved 1.4 billion kWh annually. According to the *Guiding Proposals on Energy Saving and Consumption Reduction in Zhejiang Province*, all new cement production lines in the future must be equipped with low-temperature heat recovery power generation unit, which might have disadvantageous impact on the additionality of such CDM projects.

  Heat recovery projects for steel companies also have potential to be developed as CDM projects and one example is the Dry Quenching Heat Recovery for Power Generation Project of the Ningbo Steel Company.

- **Building energy saving** The low energy efficiency of existing buildings in Zhejiang Province has caused huge energy loss, while it also means great potential in developing building energy efficiency projects and CDM projects in this field. Few energy efficiency design concept has been integrated in current building design in Zhejiang and much work need be done. Developing building energy saving projects as CDM projects now faces obstacles such as few available methodologies, comparatively small amount of emission reduction, little market interest, but in the long run, it could be practical under PCDM or

other carbon trading mechanisms to fulfill the great carbon emission reduction potential in building sector.

6. Demand for sustainable energy technologies

6.1 Demand for industrial sustainable energy technologies

Major industry sector in Zhejiang include chemical fiber, textile, and chemical engineering industries. Energy intensive industries in Zhejiang are those that demands large amount of processing heat, such as metallurgy, chemical engineering, paper making, textile and chemical fiber industry. Therefore, to improve energy efficiency of industrial installations such as boilers and kilns, pumps, renovate industrial process and improve heat insulation and transmission, are key to industrial energy saving in Zhejiang.

6.2 Demand for building sustainable energy technologies

Considering current energy utilization in Zhejiang Province, future demand for building sustainable energy technologies include:

- building energy saving design;
- integrated utilization of renewable energy technologies in buildings;
- energy renovation of heating, ventilation and air conditioning systems;
- energy renovation of building envelope.

6.3 Demand of transportation sustainable energy technologies

According to the *Medium and Long term Plan for Road and Water Transportation Energy Saving* that was issued in 2008 by the Transportation Department of China, the quantified impact of different measures on energy saving during the 2005 – 2010 period in China are listed in the table below:

	energy saving measures	energy saving effect（%）
structural energy saving	raising average truck tonaage by one ton	6
	tractor-trailer transport and trailer pick-up transport	30
	using diesel vehicles instead of petroleum ones	15
	improving technical level of roads	15-41
	improving road surface (from gravel and muddy roads to tarmac road)	10-15
technical energy saving	applying intelligent transportation system	25-50
	promoting hybrid cars	10-50
	reducing vehicles' weight by 10%	8
	raising compression ratio of engines by 1 unit	7
	replacing diagonal tyre with radial tyre	5-10
	installing spoiler for high-speed vehicles	4-10
	installing fan clutch	4-6
managerial energy saving	increasing operation mileage rate of vehicles by 1%-5%	3-15
	alleviate traffic jam	7-10
	strict maintenance system	5-30
	improving driving skills	7-25
	applying admittance and withdrawal mechanism	5-10

7. Organizations

7.1 Government administrations

- Climate Change Department of the State Development and Reform Commission of China – Chinese Climate Change website http://www.ccchina.gov.cn
- Zhejiang Provincial Energy Monitoring Force – Zhejiang Provincial Energy Management Information System http://www.zjeisn.com

7.2 CDM Sellers

- Juhua Group cooperation limiter. Major products include fluro-chemical products and basic chemical materials, with altogether 200 products of 17 categories. One of the biggest chemical companies in Zhejiang Province. http://www.juhua.com.cn
- Hongshi Holdings Group Cooperation Limited. A large-scale cement enterprise in Zhejiang. http://www.hongshigroup.com
- Zhejiang Honghuo Group. A large-scale cement enterprise in Zhejiang. http://www.honghuojt.com
- Sanshi Group. A large-scale cement enterprise in Zhejiang. http://www.leomax.com
- Linhai Limin Chemical Cooperation limited. Major products include refrigerants R12, R13, R22, R23, fumigation agent Sulfuryl fluoride, andmedical intermediate 2-Thiophene ethylamine, 2-Thiophene acetonitrile and 2-thiopheneacetic acid. http://www.limin.com.cn

8. References

- Zhejiang Statistical Yearbook 2008
- The White Paper of 2007 Energy and Its Utilization in Zhejiang Province, by Zhejiang Provincial Statistical Bureau
- Take the CDM Opportunity to Promote Sustainable Development of Zhejiang Province, Zhejiang Commission of the Chinese Democracy Promotion Council
- 2007 Energy and Its Utilization in Zhejiang Province and the current Energy Saving Work, by the Economic and Trade Commission
- Setting Standards before Energy Saving – First Batch of Provincial Energy Efficiency Standards in Zhejiang Province, Zhejiang Daily, 2007-6-29.