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VOL. 3

**Biomass Plant from Straw  
Combustion in Rudong  
Environmental Impact Assessment and  
Environmental Management Plan**

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Technology Engineering Co., Ltd.  
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## Chapter 1 Introduction

### 1.1 Background of the Project

Nowadays, governments and scientists of the whole world pay more attention to the technical development and application of the biomass energy. Our government has also attached importance to it. As an important strategy, the development of renewable energy has been placed on the *21st Century Agenda of China*.

Rudong lies in Jiangsu Plain that has rich resources of straw. Rudong has a farmland of 1,580,000 mu with an annual yield of over 900,000 tons of crops, and the yield of straw is 1,237,000 tons within a radius of 25 km, the straw has high density as well as merchandizing rate, so this place is a perfect location for establishing a straw power plant project. The 25MW Straw power plant Project that plans to obtain World Bank loan is an important component of establishing a new energy base in Rudong. And Jiangsu Guoxin New Energy Development Company Ltd. takes charge of the relevant works. The total installed capacity of the project is 25MW and estimated annual yield is 180 million kWh, of which 162 million kWh will be conveyed to the grid annually.

According to the national goal of the development and application of renewable energy, the mature technology and equipments of straw power has been introduced through international cooperation in order to realize the commercialization of straw power. Nearly four years of preliminary work and relevant works such as technology review, project site selection, introduction of technology, etc. have already completed. As a spare project of *Eleventh Five-Year Plan* of Jiangsu Province, it has been investigated and approved by the Energy Institute of National Development and Reform Commission as a national demonstration project.

### 1.2 The straw burning and utilization situation

China is a big agricultural country with straw yield one billion ton every year. In the past, the huge resources were returned to farmland directly or indirectly and can maintain the ecological balance, increase the production. In recent years, the way of using straw to produce fertilizer and returning to farmland is decreasing, but straw burning is getting worse. It not only waste resource, but also pollute environment, block transportation.

Destroy the soil system directly, and result in the decrease if organic substance .So we should

forbid straw burning and advocate the synthetic utilization.

- Impact on Air quality

The straw burning can endanger, serious air pollution and discharge a great deal of CO<sub>2</sub>, NO<sub>x</sub> and dust.. If we dot not control the concentrating straw burning, it will aggravate the air quality of china.

- Impact on Human's Health

Dust from rice straw combustion is harmful to human's health. Rice straw contains high level of silica. The emitted gas from rice straw firing contains 72.11% SiO<sub>2</sub>. If the SiO<sub>2</sub> is directly emitted into the air, it is harmful to human's health.

- Impact on quality

The straw burning can block transportation .It can result in heavy smog and blacken the sky and affect the normal take-off and landing of airplane when burning even can induce the traffic accident.

- Impact on soil

The content of organic substances and microorganism can reflect the quality of soil. With the development of standard living, the straw has become wasteful. It is not favorable to the agricultural sustain development.

### **1.3 The necessity of the proposed project**

The biomass is an important energy and is only inferior to coal, oil, natural gas. At present the exploitation of biomass in china is transiting from trial phase to commercial exploitation on large scale. The biomass has become the latest resource that has the great exploitative scale.

In conclusion, the proposed project accord with energy development strategy of china and is the beneficial supplementary of energy consumption in Jiangsu. Furthermore, the area has the beneficial and advantageous sources and the environmental benefit is evident. So it is important to exploit the biomass resource in this area.

### **1.4 Progress of Environmental Impact Assessment**

The original project site is Mabei Village, Matang Town, Rudong, Jiangsu. The New Energy Office of Rudong County, Jiangsu Province took charge of the preparatory work of the project. Jiangsu Guoxin New Energy Development Company Ltd, the project company took over the

implementation of the project in January 2006.

The New Energy Office of Rudong County, Jiangsu Province has entrusted the environmental impact assessment work of the project (25MW) to Nanjing Lark World Environment Technology Project Co., Ltd. in Nov. 2003. With the assistance of local government, the assessment team has organized on-the-spot investigation twice separately in Nov. and Dec. 2003 according to Feasibility Report and project proposal. The team investigated the environment condition and protected targets of the project, and also visited relevant departments, at the same time, the team organized various public surveys among the people and companies concerned, and then they carried out environmental monitoring work. After enduring works, the assessment team put forward environment protection measures, estimated environment protection cost, environment management plan, ways of public participation and information publication, and finally in June 2004, the environment impact assessment and environment management plan are accomplished.

The site was moved to Yinxing Village (formerly Yinbei Village), Juegang Town from Mabei Village Matang Town at the beginning of 2005. Site change reason is as follows:

(I) To keep away from the agricultural land, especially farmland as far as possible, and not affect the project construction progress;

(1) Because the national land protective policy is compelled for implementation, and more land is occupied by the original scheme, it is hard to get the approval from the state.

(2) Because the Mingxing Construction Material Co. Ltd. is a clay brick mill, by the relative rules of document (No.2002-42) of Jiangsu Province People's Government, it stipulates that simple kiln under 18 portals for illegally earth excavation existing safety risk with lagged technology shall be closed. Juegang Town People's Government closed the mill in Nov. 2004, so that 92mu land inside the mill become as idle land. At the same time, Juegang Town People's Government invited the project owner - Jiangsu Provincial Guoxin Asset Management Group Ltd. to submit to Jiangsu Province National Land Recourse Department to transfer 92mu land for the project use.

(3) During the period of the national land protective policy, the land policy is compelled for implementation, and more land be occupied by the original scheme, it is hard to get the approval from the state. But the new site is on the idle land in Mingxing brick mill, not use

farmland and easy for land use application.

(II) To reduce resettlement impact

There is not resident living in the idle land, therefore there is not house relocation problem; at the same time, the project uses idle land without land acquisition for farmland, so that it will not be concerned with resettlement problem.

(III) Other favorable factors

(1) Located near No.223 provincial road, transportation of new site is convenient;

(2) It is surrounded by waters on three sides. This can guarantee the water supply for the power station operation;

(3) The project site is close to the fire department, only 3km away, so that the safe operation of the power station can be rather highly guaranteed.

(4) The project constructed in the new site could save the costs of house rehabilitation, resettlement and compensation, therefore to reduce the project investment.

In January 2006, the project company entrusted the revision work of environmental impact assessment to Nanjing Lark World Environment Technology Project Co., Ltd. The environmental impact assessment was revised again in April 2006, finally in July 2006; the environmental impact assessment for the changed site was accomplished.

The proposal that suggests the straw as fuel is a recycling energy project, but the construction work of the project may includes confiscating lands, rezoning the district and relocation of population, so the project is classified as a B class construction project.

The assessment team ensures that Chinese and English version of all documents are coherent. Because of the differences between Chinese and English, the expression may be different but there is no essential difference.

### **1.5 Assessment Goal**

By investigating, monitoring and analyzing the natural environment, social environment and present environmental quality in the assessment range of the proposed project, various impacts brought by the project have been analyzed and forecasted qualitatively or quantitatively, and corresponding environment management plan have been prepared, to reach the following goals:

- To ensure the feasibility of proposed project on the aspect of environment protection;



- To ensure any environmental impacts are confirmed in the preparing phase and ensure countermeasures be implemented during the process of project;
- According to the environmental impact forecast, putting forward measures and compensation for adverse environmental impact;
- To provide a scientific basis for the local development and environment management plan.

## **1.6 Basis of Assessment**

### **1.6.1 Requirement of World Bank**

Because the proposed project is applying for World Bank loan, seven elementary policies of World Bank are applied in the assessment, as follows:

- *Environment Assessment*(OP4.01)
- *Forestry*(OP4.36)
- *Natural Habitat*(OP4.04)
- *Culture Property*(OP4.11)
- *Insect Pest Administration*(OP4.09)
- *Involuntary Migration*(OP4.12)
- *Contentious Region Project*(OP7.60)
- Thermal Power: Guidelines for New Plants set out in the WB's Pollution Abatement Handbook

In the above policies, *Environment Assessment* (OP4.01) is an elementary requirement, for the project is not within the regions defined in (OP7.60), (OP4.11), other policies such as *Environment Assessment*, *Involuntary Migration* will be applied in the report as well.

### **1.6.2 Domestic Laws and Regulations**

- *Law on Environmental Protection of the People's Republic of China* (1989. 12)
- *Law on County Soil Contraction of the People's Republic of China* (2002. 8)
- *Law on Villager Committee Organization of the People's Republic of China* (1998. 11)
- *Law on Soil Management of the People's Republic of China* (1999. 1)
- *Implementation Ordinance on Soil Management of the People's Republic of China* (No.256 Decree issued by People's Republic of China State Council)

- *Law on Water and Soil Conservation of the People's Republic of China* (1996.6)
- *Law on Prevention and Treatment of Water Pollution of the People's Republic of China* (1996.5)
- *Law on Prevention and Treatment of Environmental Air Pollution of the People's Republic of China* (2002. 4)
- *Law on Prevention and Treatment of Environmental Noise Pollution of the People's Republic of China* (1997.3)
- *Law on Prevention and Treatment of Solid Rubbish Environmental Pollution of the People's Republic of China* (1995.10)
- *Rule on Environmental Protection of Construction Project Management* (No.253 Decree issued by People's Republic of China State Council);
- *Environmental Protection Management Method on Electric Power Industry* (No.9 Decree issued by People's Republic of China Department of Electric Power Industry)
- *The Notice on Strengthening Environmental Impact Assessment and Management of the Construction Project that May be Provided Loan by International Finance Corporation* to (National Environmental Protection General Bureau, National Program Committee, Ministry of Finance, People's Bank of China, 1993)
- *Ordinance on Soil Management of Jiangsu Province* ((2000.10)
- *Partition of the Surface Water Function Region of Jiangsu Province* (2000.3)

### **1.6.3 Domestic Standards**

- *Quality Standard of Environmental Air of China*, (GB3095-1996)
- *Atmosphere Contamination Discharging Standard of Fire Power plant*, (GB13223-2003)
- *Quality Standard of Surface Water Environment of China*, (GB3838-2002)
- *Sewage General Discharging Standard of China*, (GB8978-1996)
- *Environmental Noise Standard of City Zone of China*, (GB3096-93)
- *Factory Boundary Noise Standard of Industrial and Enterprise of China*, (GB12348-90)
- *Industrial Standard on Environment Protection of China: Technical Guidelines on Environment Impact Assessment* (HJ/T2.1-93)

### 1.7 Assessment Range

The project's likely influence is shown in Table 1-7-1 and assessed in this report.

Table 1-7-1 Table of assessment range

Assessment Content	Assessment Range
Social Environment	Juegang Town
Eco-environment	Surroundings of factory
Sound Environment	Out of the factory boundary, from 1m to 200m around
Atmosphere Environment	Around the center of the factory within a radius of 36km <sup>2</sup>
Surface Water Environment	Upriver 1000m and downriver 1000m along Jiuyao River Dock reserved for the project

### 1.8 Assessment Factors

According to the features of this project and the generic environmental impact assessment experience of power plant, the assessment factors of the project are as following:

- 1 Sound environment: LAeq;
- 2 Air Environment: NO<sub>2</sub>, PM<sub>10</sub>, SO<sub>2</sub>;
- 3 Water environment: COD<sub>Mn</sub>, Petroleum, CODcr, pH, TP, NH<sub>3</sub>-N; SS;
- 4 Eco-environment: Soil erosion;
- 5 Social environment: Social economy, Living condition, Fundamental facility.

### 1.9 Content of Assessment

According to the project situation and its geographical location, the contents of environmental assessment include:

- 1 Eco-environmental impact assessment
- 2 Atmosphere environmental impact assessment including risk analysis
- 3 Surface water environmental impact assessments
- 4 Sound environmental impact assessment
- 5 Social environmental impact assessments

Atmosphere environmental impact assessment (including risk analysis), assessment of land requisitions and resettlement arrangement will be the emphasis of the project.

### 1.10 Objectives of Environmental Protection

According to on-the-spot investigation and data provided by the relevant local departments, the working team confirms that there doesn't have any natural protection zone, scenery showplace, cultural relics and historic sites in the assessment area. The proposed protection objects

surrounding the project area are as follows:

Table 1-10-1 Environmental Protection Objects

Environmental factor	The goal of the environmental protection	The executive standard of China	The present environmental situation	The action of the influence in the constructing process
Eco-environment	The ecological environment surrounding the plant area		The farmland and vegetation is good	Influence of construction such as transportation
Atmosphere environment	Juegang town	Second degree <sup>(1)</sup>	Excellent	Influence of atmosphere pollutant emission
Water environment	Jiuyao River	Fifth degree <sup>(2)</sup>	Bad	The industrial wastewater emission
Sound environment	Surrounding residents	First degree <sup>(3)</sup>	Excellent	The noise of the equipment
	The irrigating project in the farmland			The farmland will be covered by the factory
	The people's health in the constructing spot and concentrating resident area		Good	Intercourse of the people

Remark:

(1) According to *Ambient Air Quality Standard of China*, (GB3095-1996)

(2) According to *Quality Standard of Surface Water Environment of China*, (GB3838-2002)

(3) According to *Environmental Noise Standard of City Zone of China*, (GB3096-93)

## 1.11 Assessment Standards

According to the requirement of *Technical Guidance Rule on Environmental Impact Assessment of China*, the following standards are applied.

### 1.11.1 Environmental Air

As for the quality of environmental air, the secondary grade standard of the *Ambient Air Quality Standard* (GB3095-1996) is applied, and the figures are in Table 1-11-1. For emission of air pollutants, the *Emission standard of air pollutants for power plants* (GB13223-2003) is applied, and the figures are in Table 1-11-2.

Table 1-11-1 Ambient Air Quality Standard (GB3095-1996)

	Project	SO <sub>2</sub> (mg/Nm <sup>3</sup> )	PM <sub>10</sub> (mg/Nm <sup>3</sup> )	NO <sub>2</sub> (mg/Nm <sup>3</sup> )
Secondary grade of the standard	One hour average concentration	0.50	-	0.24
	Daily average concentration	0.15	0.15	0.12
	Annual average concentration	0.06	0.10	0.08

Table 1-11-2 Emission Standard of Air Pollutants

Pollutants	emission concentration (mg/Nm <sup>3</sup> )	World Bank Emission Concentration Standards	Remark
PM <sub>10</sub>	50	For PM, 50mg/Nm <sup>3</sup> ; for SO <sub>2</sub> , less than 0.20 tons/day/MWe for plants of < 500MWe; and for NO <sub>2</sub> , 750mg/Nm <sup>3</sup>	The standard in the □ stage in <i>Emission standard of air pollutants for power plants</i> (GB13223-2003)( excess air coefficient α is 1.4)
SO <sub>2</sub>	400		
NO <sub>2</sub>	450		

### 1.11.2 Surface Water

According to *Surface Water Environment Function Plan in Jiangsu Province* (2003.3), the fifth grade standard of *Environment Quality Standard for Surface Water* (GB3838-2002) is applied in Jiuyao River, and the figures are in Table 1-11-3. For wastewater discharge, the first grade standard of *Wastewater Discharge Integrated Standard* (GB8978-1996) is applied, and the standard values are in Table 1-11-4.

Table 1-11-3 Quality Standard for Surface Water

Item	PH	DO (mg/L)	COD <sub>Mn</sub> (mg/L)	COD <sub>Cr</sub> (mg/L)	NH <sub>3</sub> -N (mg/L)	T-P (mg/L)	Petroleum (mg/L)
Standard value	6~9	3	6	20	1.5	0.3	0.05

Table 1-11-4 Wastewater Discharge Standard

Item	PH	SS (mg/L)	BOD <sub>5</sub> (mg/L)	COD <sub>Cr</sub> (mg/L)	Petroleum (mg/L)	TP (mg/L)	NH <sub>3</sub> -N (mg/L)
Standard value	6~9	70	30	100	10	0.5	15

### 1.11.3 Sound Environment

As the neighborhood of the project is farmland, sound environment is applied the first grade *Standard of Environmental Noise of Urban Area (GB3096-93)*. The specific standard values are in Table 1-11-5. Factory boundary noise of the project will comply with the first grade standard in *Standard of Noise at Boundary of Industrial Enterprises (GB12348-90)*. The specific standard values are in Table 1-11-6. *The Standard of Noise at the Construction Period* will be complied during the construction.

Table 1-11-5 standard of Environmental Noise

Project	Daytime	Nighttime
Standard value Leq (dB(A))	55	45

Table 1-11-6 Standard of Noise at Boundary of Industrial Enterprises

Project	Daytime	Nighttime
Standard value Leq (dB (A))	55	45

Table 1-11-7 Standard of Noise at the Construction Period

construction	noise	The limiting value of noise	
		Daylight	Nighttime
digging	bulldozer、grab、	75	55
piling	vibrating pile driver	85	forbiden
structure	concrete beater、temper、electrical saw	70	55
decorate	crane、elevator	65	55

Table 1-11-8 World Bank Noise Guidelines

Receptor	Maximum allowable log equivalent (hourly measurements), in (dB(A))	
	Daytime Leq(dB(A)) (07:00-22:00)	Nighttime Leq(dB(A)) (22:00-07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

### 1.11.4 Solid Waste

The solid waste will comply with the *Standard Value of Pollutant in Agricultural Use Powder*.

Table1-11-9 Standard Value of Pollutant in Agricultural-Use Powder mg/kg

Item	The maximum permitted content	
	Acid soil	Neutral and alkaline soil
	( pH < 6.5 )	( pH ≥ 6.5 )
Cd	5	10
As	75	75
Mo	10	10
Se	15	15
Ni	200	300
Cr	250	500
Cu	250	500
Pb	250	500
PH	10.0	8.7

### 1.12 Assessment Methods and Working Procedure

Mathematic models and analogy are used to analyze the project's likely positive and negatively impacts.

Mathematic Models are used to simulate the project's likely impacts on environmental air, noise and water. Social-economic and eco-environmental impacts resulted from the project are analyzed by on-the-spot investigation and analogy.

## **Chapter2 Project Survey**

### **2.1 Geographical Location Geological Condition of the Project**

Juegang Town, situated in the southeast of Jiangsu Province and at the meeting point of Yangtze River and the development belt, is the big industrial and agricultural town of the Yangtze River delta and one of the 100 noted towns of Jiangsu Province.

Juegang Town has peculiar geographical environment and favorable weather conditions. Surrounded by the sea on all sides, it has the typical maritime climate. It has four distinct seasons, ample rainfall and sufficient sunshine. It is mild and humid, and has a long frostless period. All of these ensure that there are abundant agriculture by-product resources and sea product resources.

The proposed location of the plant is flat, and the height of the land is about 4m, and it is geologically situated at Tongchen massif, far away from the boundary of massif. Its structure is basically stable. The average earthquake magnitude is VII grade. The foundation of the location is consisted of powder clay, powder earth, powder and fine sand.

### **2.2 The Scale of the Proposed Project**

The proposed project (25MW) is consisted of warehouse, boiler house, turbine house etc, with an area of 92 mu and the total investment of RMB 291.82 million. The electric power production capacity is 25MW. The working hour is 6975 hours per year. The consumption of straw is 153,450 tons annually. The annual electric power production is 174 million kWh, of which 157 million kWh will be conveyed to the grid annually. Factory can provide jobs for 80 employees.

### **2.3 Service Functions of the Proposed Project**

In 2003, the total consumption of electric power of Rudong County is 698 million kWh, the maximum capacity reaches 130MW, and the consumption of electric power of Rudong County is 830 million kWh in 2005, the maximum capacity will be 183MW. After the completion of Rudong straw power plant it can offer clean energy for economy development of this area and become available complement of power supply for Jiangsu Province Electricity Net.

### **2.4 Status of Power Supply in Rudong**

The electricity net of Rudong is at the end of Jiangsu Electricity Net. Its main power supplier is Jiangsu Electricity Net. At present there is one transformer substation of 220KV, six



transformer substations of 110KV and ten transformer substations of 35KV in the whole county, which composed the electricity-providing net. The circuit of 220KV (from Liu-Bridge to Juegang Town) supplies most charge of the whole county.

The distribution of electricity in Rudong County is that: on one side the charge is relatively centralized because the industries are centralized in center town; on the other side the charge of electricity used by agriculture and aquaculture is low in density and relatively dispersed.

## **2.5 Project Overview**

### **2.5.1 Project Coverage Brief and the Plane Layout of the Plant Area**

The total area of the plant is 92 mu. The occupied area of the construction is within the occupied area of the electricity plant.

The straw warehouse located on the south west side of Jiuyao River. The size is  $54 \times 67.2\text{m}$ .

The technique procedure requires the boiler house to be near the straw warehouse, and the center of the warehouse to be close to the central line of boiler, so the stuff can be transferred to boiler directly.

To the southern and northern side of the power plant is residential area, and there is a provincial road in the east, so the chimney is better build in the north to the center. Facing East-North-East (ENE), the power plant has Yaohe River on the back. There is no resident in West-South-West (WSW) area. The chimney is situated in the north to the center. Main wind direction is ENE. The gas from the chimney has no impact on the nearby residents and on the plant area environment. The turbine house is better build in south, thus can meet the requirements of turbines for aeration and lighting.

The location of the cooling tower should avoid the influence of winter wind to the main factory buildings, and be near the turbine house, thus can eliminate the length of pipes of circulating water. The cooling tower will be located on the north-east corner of the factory area. The cooling tower situates more than 300m away from the road in the east. There is no passage way for people and material nearby the cooling tower. With a water drenching area of  $1250\text{m}^2$ , the cooling tower is made from reinforced concrete and is hyperbola natural-aeration with reverse flow. Tower height: 54m; air inlet height: 3.5m; radius at 0m: 22.06m; inverted T-type base. Cycling water quantity of the unit is  $5900\text{m}^3/\text{h}$ . The spray radius



end of the burning boiler. Straw will be burned and water around the boiler wall will be heated to turn into steam and the temperature is up to 540°C. After this there are also three continuous processes:

(1) The steam passes through overheated settings and pushes the steam turbine to rotate. The steam turbine is connected with electricity generating settings. It can produce 10KV electricity and then improve the voltage to 110 KV. Electricity will be transmitted by underground cable to transformer stations and then to the network.

(2) The steam pressure and temperature are both decreased to some extent after having passed through steam turbine. And then it will enter the condenser and be condensed by circulating cooling water. The steam turns into water again after being cooled and flows into closed water-circulating pipeline, which is circling boiler wall and then starts new circulation again.

(3) When the straw is on burning, the unburned part and the burned ashes will deposit at the bottom of the boiler, and the smog will enter the bag-house filter chambers. At this time smog has been filtered and cleaned, and then it will be let out through chimney.

(4) The ashes from the boiler and filter will go through the pump transmitting system and be transported into the ash house, then be transported to farmland by hermetic vehicles.

Table 2-5-2 Main Equipments and Environment Protection Facilities

Item		Unit	The existing machines	
Production and operating time	Production	MW	25	
	Time	h/a	7200	
Boiler	Category		Compound boiler	
	Vaporizing quantity	t/h	110	
Turbine	Category		Turbine	
	Output forces	MW	25	
Generator	Category		Generator	
	Capacity	MW	25	
filter	Equipments for removing dust	Category	Bag-house filter	
	Chimney	Type	Armored concrete	
		Height	m	120
		Inner diameter of exit	m	2.5
Wastewater discharge	Industrial Sewage Treatment and Recycling			
Manner of Cooling	Circular Cooling Tower			
Ash	Complex Utilization			

### 2.5.3 Fuels and Element Analysis

There is abundant straw resource in this area. The production is 1,237 thousand tons within a 25 kilometers radius. The quantity of straw that can be merchandised is 760 thousand tons. Density of straw resource is high and climate has little impact on straw production, so straw can completely meet the fuel need of the project. Straw is to be transported by land. Analysis result of straw composition of the project can be seen in table 2-5-2. In the preliminary work, the four kinds of stalk (such as rice stalk, wheat stalk, cotton stalk and cornstalk) have been sent to authorities for test. The proposed operating time per year is 6975 hours and straw wastage is 153.45 thousand tons.

Table 2-5-3 Analysis Table of Straw Composition of Electricity Plant

Straw properties	Unit	Average fuel	Min.	Max.
Moisture content	%	11.0	7.0	25.0
Basis analysis (dry)				
Fixed carbon	%	18.7	16.5	21.5
Volatiles	%	76.1	71.9	80.9
Ash content	%	5.2	2.6	11.5
Elementary analysis (dry)				
Carbon	%	45.4	41.5	47.8
Hydrogen	%	6.1	5.7	6.7
Nitrogen	%	0.60	0.40	0.96
Sulfur	%	0.08	0.05	0.148
Oxygen	%	41.16	36.77	43.36
Chlorine	%	0.41	0.07	1.19
Ash content	%	6.26	2.6	12.86
Low heat value (dry)	MJ/kg	17.04	15.60	17.60

### 2.5.4 Warehouse

In order to ensure the abundance, reliability, stability and security of straw, the project company will build one central station and four key stations. The central station is located near the main building. Locations of other 4 stations are under planning and selection.

### 2.5.5 Water

There are two resources of water supply for the power plant. Daily water and chemical water will be supplied by tap water; circulating supplement water used in production process is from Jiuyao River. The water fetching mouth is set in east bank of Jiuyao River, which is situated

at the place 15 m away from west side of the power plant.

The proposed water demand of this project is about 121 m<sup>3</sup>/h. According to the Hydrology data, the water quantity of Jiuyao River can perfectly meet the need of the production. The proposed water demand of this project can be seen in table 2-5-3. The water quantity balance graph of proposed project can be seen see figure 2-2.

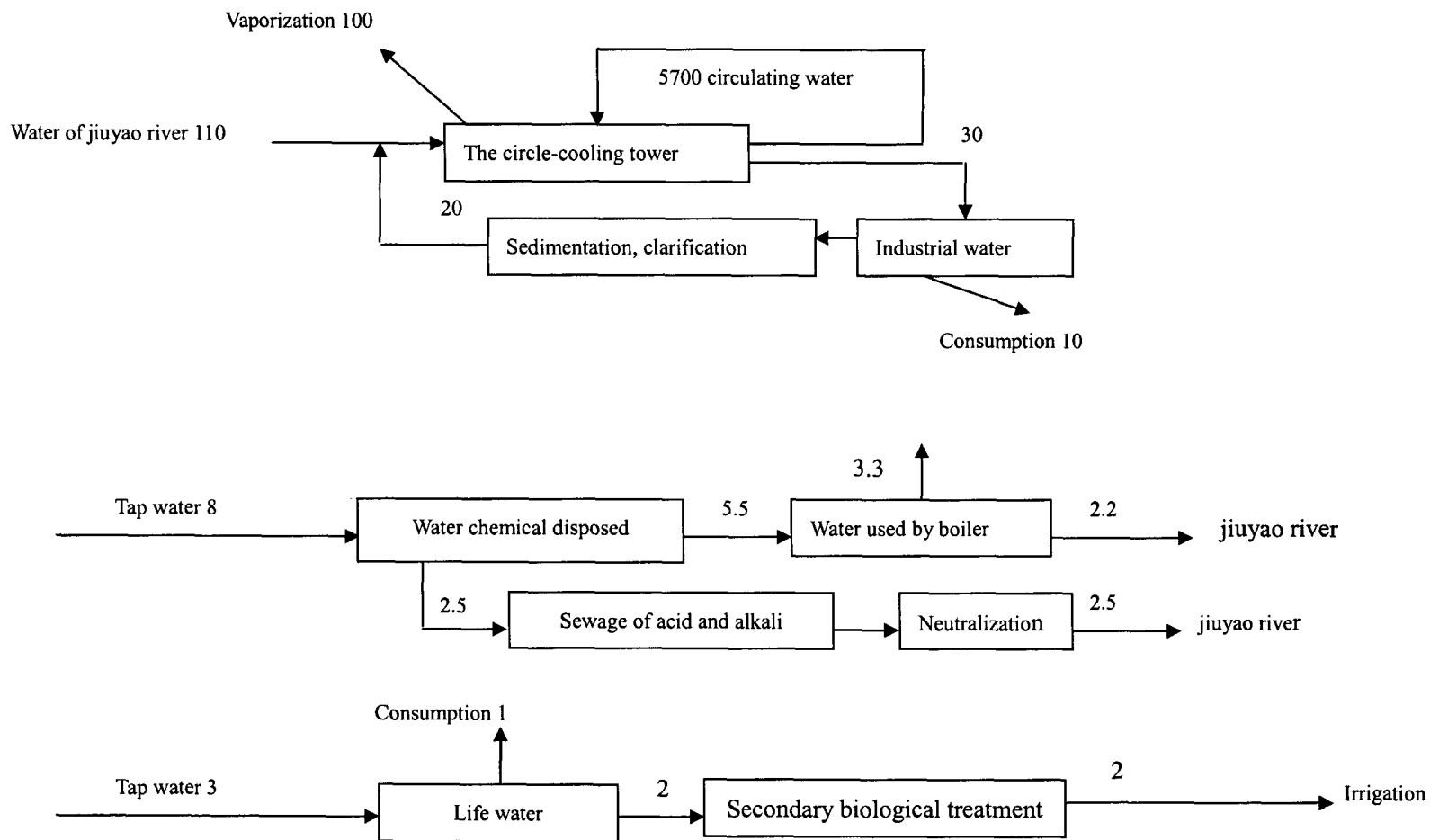


Figure2-2 The Water Quantity Balance Graph of Proposed Project ( $m^3/h$ )

Table 2-5-4 The Table of Water Usage

Water species	name	purpose	unit	quantity
Tap water		Circulating water	m <sup>3</sup> /h	110
		daily water	m <sup>3</sup> /h	3
		Chemical water	m <sup>3</sup> /h	8

### 2.5.6 Composition and Disposal of Ash

Perhaps there is a little heavy metal in ash, so we made a composition analysis of ash. The result can be seen in 2-5-5. It can be seen that the quantity of heavy metal is very tiny and can meet the requirement the *Standard Value of Pollutant in Farming Powder*. There is no soil accumulation effect and harm on people.

The unburned straw and the ash of burned straw can return to farm fields, which can be added to soil as fertilizer and improve soil quality without pollution.

Table 2-5-5 Heavy Metal Analysis of Ash

item	content	standard	unit
Cd	0.248	5	mg/kg
Hg	0.872	3	
As	14.9	75	
Cu	42.1	250	
Pb	4.9	250	

## 2.6 Main Pollutants

### 2.6.1 Air pollutant

According to the utilization aim of renewable energy in China, the proposed project will introduce the mature technique and equipments of straw power into China, realizing the commercialization and mass production of straw power. As biomass energy, the straw is renewable energy and harmless. Furthermore, straw is a low carbon fuel which content of sulfur and ash is lower than the coal that was used widely, so it is a “clean” fuel. With the effective measures, the gas produced by combustion pass through a bag-house filter before emission to the atmosphere, so the concentration of pollutant accord with the □ period standard in *Emission Standard of Air Pollutants for Thermal Power Plants (GB13223-2003)*(air excess coefficient  $\alpha$  is 1.4):  $SO_2 < 400mg/m^3$ ;  $NO_x < 450 mg/m^3$ ;  $PM_{10} < 50mg/m^3$ .

The main fuel of proposed project is wheat stalk, rice stalk and cornstalk etc. According to the test data, the content of ash vary from 2.6% to 12.86% and the average content is 6.26%;the content of sulfur vary from 0.05% to 0.148% and the average content is 0.08%. Because the content of ash and sulfur fluctuate greatly, the assessment account with the maximum content. The emission circumstance of pollutant of this project is seen in table 2-6-1.

Table 2-6-1 Emission Condition and Quantity of Air Pollutants

Item		Unit	Proposed project
Chimney	Geometry height	m	120
	Inner diameter of the exit	m	2.5
Emission circumstance of smog	Air excess coefficient	$\alpha$	1.4
	Smog quantity	Nm <sup>3</sup> /h	168268
Parameter of chimney exit		Temperature of exhausted smog	°C
Exhaust circumstance of environmental air pollutant	SO <sub>2</sub>	Emission	kg/h
		Concentration	mg/Nm <sup>3</sup>
		Standard value	mg/Nm <sup>3</sup>
	PM <sub>10</sub>	Emission	kg/h
		Concentration	mg/Nm <sup>3</sup>
		Standard value	mg/Nm <sup>3</sup>
	NO <sub>x</sub>	Emission	kg/h
		Concentration	mg/Nm <sup>3</sup>
		Standard value	mg/Nm <sup>3</sup>

### 2.6.2 Waste Water Discharge

The proposed project uses circulating cooling system, and the power plant discharges mainly chemical, industrial and life sewage.

- The water from the cooling tower is with no toxicity, and can be used for industrial water;
- The industrial water can be used for cycle supplement after sedimentation, clarification;
- The chemical acid and alkali wastewater is treated by the counteracted pool, and can be drained to Jiuyao river after the pH value 6~9;
- The living area of the electric plant is not in the plant, so the life wastewater exhausting quantity is little. A set of equipment with a capacity of 2m<sup>3</sup>/h will be built to dispose the life wastewater in the plant area. The life wastewater is introduced into a grate well to remove impurities, then to a sedimentation tank. The wastewater from the



sedimentation tank is charged into the primary oxidation tank, the secondary oxidation tank, the third oxidation tank and a sedimentation tank successively. The water after treatment is discharged into a disinfection pond. The treated water which meet Class I Standard of *Sewage General Discharging Standard of China, (GB8978-1996)* will be reused as irrigation water for greens. Discharge is under the requirement of water usage, and is arranged reasonably for multiple usage of water, thus reduce the quantity of discharge. The factory water discharge system is a kind of life, production water and rainwater divided discharge system.

For the wastewater discharge and treatment, see table 2-6-2.

Table 2-6-2 Wastewater Discharge and Treatment

Waste water	Let quantity (t/h)	Pollution factor	Treatment manner	Whereabouts			
Cooling sewage	20	Salt	—	For industrial water			
Acid and alkali water	2.5	pH	Neutralization	Jiuyao river			
Boiler sewage	2.2	SS	cooling	Jiuyao river			
Life sewage	2	COD、BOD <sub>5</sub>	Secondary biological treatment plant	Irrigation			
Wastewater Discharge Standard							
Item	PH	SS (mg/L)	BOD <sub>5</sub> (mg/L)	CODcr (mg/L)	Petroleum (mg/L)	TP (mg/L)	NH <sub>3</sub> -N (mg/L)
Standard value	6~9	70	30	100	10	0.5	15

### 2.6.3 Ash Dregs

The quantity of produced ashes and unburnt materials of this project is about 15,000 ton/year. To prevent ashes from flying in transportation, ashes and dregs of this project are transported by hermetic transportation with belt.

The straw not only consists of N, K, P, but also Ca, Mg, Si etc. So the ashes and unburnt materials can be packed with decomposable plastic bags and be sent to farmland as fertilizer. It can add to soil fertility and improve soil quality without pollution to the environment.

### 2.6.4 Noise

The noises of this project are mainly located in main workshop and air-blower rooms etc. The equipments with big noise are steamers, generators, machines motivated by magnets, condensed water pumps, shooting water pumps and water pumps motivated by electricity, **ID and FD Fans**etc.

Table 2-6-3 The Noise Intensity of Equipment unit: dB(A)

Serial number	Equipment	Noise degree	Quantity
1	Generator	90	1
2	Steamer	90	1
3	ID and FD fans	85	1
4	Cooling tower	95	1
5	Circulating water pump room	85	1
6	Main transformer	75	1
7	The empty pressure work room	120	1

### 2.7 Reasons for Plant Site Selection of the proposed Project (see detail in Section 1.4)

- The proposed project area has rich straw resources of high density, which is seldom influenced by the climate, and local villagers have strong commercial consciousness, which satisfy the project's requirements for raw materials;
- Rudong County has dense highways, watercourses and numerous farm trucks, which provides better stalk transportation. The candidate site of the project is within 1 km to Jiangsu Provincial No.223 Road and Rutai Canal (the 4th grade watercourse), which satisfies requirements for the transportation of enterprise equipments and future raw materials;
- In the west of the candidate site is Jiuyao River, which ensures the supply of circulating water and industrial water.
- The brick factory of Mingxing Construction Materials Company has been closed and the land there belongs to the idle construction land. The change of the site meets the national industry policy and will not involve the dismantlement, resettlement and compensation.

### 2.8 Investment Estimation and Financing

Total investment is RMB 291.8278 million. The capital of the project is RMB 96,090,000. The project will apply the world bank loan of \$ 2000 and. The domestic long-term loan of RMB37, 756, 000.

### 2.9 Implement Plan

According to the construction progress of the straw power project, the project will be accomplished in two years, and the whole construction time is two years.

## Chapter 3 Survey of Conditions

### 3.1 Environment condition:

Rudong County of Jiangsu Province is subjected to Nantong city. It situates in the northeast of Yangtse River Delta. Adjacent to the Yellow Sea on the east and Yangtse River on the south, it is contiguous to the hinterland of Jiangsu' middle part on the west and connects with the plain of Jiangsu' north part on the north. Its total area is 1872 km and it owns a gold coast of 106 km. Its population is 1,130,000. It administers 15 towns and the county government is situated in Juegang town. In the south and north areas of the county is the provincial development zone—Rudong Economical Development Zone of Jiangsu Province. Every town has its industrial park and the investment environment and life service are favorable there.

Rudong County runs 64 km from east to west and 46 km from south to north. It is a typical alluvial plain along the sea. Its terrain is flat and there are luxuriant forests, a crisscross of rivers, verdant fields and good transport facilities. There are four first-class waterways, 23 second-class waterways and more than 100 third-class rivers.

Juegang Town has peculiar geographical environment and favorable weather conditions. Surrounded by the sea on all sides, it has the typical maritime climate. It has four distinct seasons, ample rainfall and sufficient sunshine. It is mild and humid, and has a long frostless period. All of these ensure that there are abundant agriculture by-product resources and sea product resources.

### 3.2 Weather Condition

Rudong situates at the common boundary of the temperate zone and the subtropics zone. It is marine monsoon climate of the north subtropics zone. It is mild and humid. It has four distinct seasons and ample rainfall and sufficient sunshine. The yearly average temperature is 15℃ and the average wind speed is 3.5m/s. The dominant wind is southeasterly wind, second to which is northwesterly wind. The yearly average rainfall is 1046 mm and the average sunshine time is 2048 hours. And the yearly average no-frost period is 222 days.

### 3.3 Water Conservancy

Rudong is close to rivers and seas. There is a network of rivers that belongs to the water

system of Yangtse River. In the whole year, there is no waterlog or drought. According to the historical records, the highest tide of Yangtse River in Rudong is 5.537m (in 1997) and the highest tide of the Yellow Sea is 5.3 m (in 1997).

The water level of the inland river is as follows: 3.96m in the east of Nan tong, 3.6m in the middle west, 3.2m in the middle east and 3.0m in the area by the river. The deepest part of the Juejian River is about 3.5 m. During the period of irrigation, the brakes are opened to draw water and 0.3-0.5m could raise the water level of the rivers in every area. While during the period of typhoon and rainstorm, brakes are opened to drain water and the water level could be drawn down by 0.2-0.3 m. The part of Ru-Tai canal in Rudong area is 67.50 km in length and it flows from west to east most of the year. The estuary of the canal is 20-40 m in width. Jiuyao River is straight. It is 23.1km in length and its estuary is 30-50m in width. The drain brakes influence its current speed and flow direction, but the main flow direction is from the south to the north. It flows backwards few times and the average current speed is 0.1m/s.

The groundwater is about 30m in depth and the fresh water of high quality is about 300 ~400m under the ground.

### **3.4 Brief Introduction of the Related Regions**

Rudong County of Jiangsu Province is subjected to Nantong city. It situates in the northeast of Yangtse River Delta. Adjacent to the Yellow Sea on the east and Yangtse River on the south, it is contiguous to the hinterland of Jiangsu' middle part on the west and connects with the plain of Jiangsu' north part on the north. Its total area is 1872 km and it owns a gold coast of 106 km. Its population is 1,130,000. It administers 15 towns and the county government is situated in Juegang town. The south and the north areas of the county are the provincial development zone—Rudong Economical Development Zone of Jiangsu Province. Every town has its industrial park and the investment environment and life service are favorable there.

The factory site, facing water on its three sides, has rich water resources. It is convenient to take water, which can be used as industrial water by the power plant after the decontamination. There is more than 100 acre reserve land for construction, which provides a good possibility of further development in the final-period construction. Besides, the leaders of the Juegang Town government attach importance to the project, so the humane environment is favorable. They have a clear guiding principle of developing the new energy, great capabilities in controlling the situation

and cooperating. The town has plentiful financial resources. In order to activate the land of the brick factory, the town government would like to, and is able to undertake the infrastructural construction and subsidize the land price, which provides a good foundation for carrying out the project smoothly.

### **3.5 Ecological Environment**

#### **3.5.1 Agricultural Ecology**

The seat of the project is agricultural cultivating area. The main crops include paddy, wheat and corn. Besides, there are some kinds of vegetables.

#### **3.5.2 Distribution of Animals and Plants**

Due to the continuous exploitation for many years, the artificial vegetation has substituted the natural vegetation of this area. The current vegetation includes China firs, pines, tea trees, bamboos and fruit trees etc. There are some wild birds such as tits, culvers, peckers, big cuckoos and thrushes etc. There are mammals such as dogs, hedge pigs, hares and raccoon dogs etc.

### **3.6 Natural Resources**

#### **3.6.1 Touring Resource**

According to site investigation carried out by the project company, the institute who perform the EIA and Rudong Development and Reform Commission, there is no scenic spot in the evaluated areas of the proposed project.

#### **3.6.2 Mine Resource**

According to site investigation carried out by the project company, the institute who perform the EIA and Rudong Development and Reform Commission, there are no primary mine resources near the seat of the proposed project.

#### **3.6.3 Water Resource**

The main resource advantage of Juegang Town lies in its abundant water resource. In the evaluated areas, there are main first-class rivers, Ru-Tai Canal and Jiuwei Canal, and the second-class river Jiuyao River. The three rivers converge in Juegang town and continue their ways. Ru-Tai Canal flows eastward and Jiuyao River flows northward into the Yellow Sea. Controlled by the drawing brakes and the drain brakes, they have permanent current directions.

### 3.6.4 Cultural Relics and Historic Sites

According to the initial investigation by the assessment team, there are no cultural relics or historic sites on the earth surface along the roads (see attachment: Certificate provided by Rudong Culture Bureau)

### 3.7 Survey and Assessment of the Environmental Quality

#### 3.7.1 Survey and Assessment of the Air Quality

Rudong County situates at the common boundary of the temperate zone and the subtropics zone. It is marine monsoon climate of the north subtropics zone. It is mild and humid. It has four distinct seasons and ample rainfall and sufficient sunshine. The yearly average temperature is 15℃ and the average wind speed is 3.5m/s. The dominant wind is southeasterly wind, second to which is northwesterly wind. The yearly average rainfall is 1046 mm and the average sunshine time is 2048 hours. And the yearly average no-frost period is 222 days.

The assessment team chooses the Public Special Repair Station, the nearest waterworks from site of the project and the Tianshui Village to leeward as the monitoring points of air quality, and consults the monitoring data of the monitoring station of Rudong County. The distribution of the monitoring points is shown in table 1 and in table 3-7-1.

- Monitoring period: five days from June 23 to June 27 of 2006; four times a day.
- Monitoring basis: Relative regulations on investigation on air quality stated in Chapter 5.5 in General conditions of Technical Guidelines on Environment Impact Assessment (HJ/T2.1-93). Monitoring work is conducted at least four times a day at one to three points in any season for at least five days.

Table 3-7-1 Distribution of the air monitoring points

Monitoring point	Name of monitoring point	Scope	Distance from the site of the plant (m)	Remarks	Monitoring item
G1	Public Special Repair Station	EEN	3000	Blending area	SO <sub>2</sub> 、PM <sub>10</sub> 、NO <sub>2</sub>
G2	Waterworks	E	250	Blending area	
G3	Tianshui village	SWE	2300	Country	

Table 3-7-2 Results of the air quality monitoring in the evaluation region

Item	Number of the monitoring points	Hourly value		Daily value		Average value ( mg/m <sup>3</sup> )
		Concentration range( mg/m <sup>3</sup> )	Exceeding standard rate( % )	Concentration range ( mg/m <sup>3</sup> )	Exceeding standard rate( % )	
SO <sub>2</sub>	1	0.004 ~ 0.012	0	0.005 ~ 0.006	0	0.005
	2	0.004 ~ 0.013	0	0.005 ~ 0.008	0	0.007
	3	0.004 ~ 0.011	0	0.005 ~ 0.006	0	0.0085
	Average value in the evaluation region	0.004 ~ 0.013	0	0.005 ~ 0.008	0	0.005
NO <sub>2</sub>	1	0.004 ~ 0.010		0.004 ~ 0.008	0	0.006
	2	0.004~0.011		0.004 ~ 0.009	0	0.007
	3	0.004~0.009		0.004 ~ 0.006		0.005
	Average value in the evaluation region	0.004~0.013		0.004 ~ 0.009	0	0.006
PM <sub>10</sub>	1			0.07 ~ 0.11		0.10
	2			0.05 ~ 0.08	0	0.07
	3			0.07 ~ 0.13		0.10
	Average value in the evaluation region			0.05 ~ 0.13	0	0.10

The monitoring results indicate that the air quality of the new site is good. The hourly average concentrations and daily average concentrations of SO<sub>2</sub>、NO<sub>2</sub> of the three air factors reach standard □ of Ambient Air Quality Standard (GB3095-1996) of P.R.C. The daily average concentration of PM10 reaches the standard □.

### 3.7.2 Survey and Assessment of Water condition

In order to know the environmental quality of Jiuyao River around the project site, the assessment team carries out the monitoring work of Jiuyao River, the important water resource of the project. The monitoring sections are shown in attached figure 4. The distribution of the

monitoring points is shown in table 3-7-3 and the results are shown in table 3-7-4.

Table 3-7-3 Distribution of the water monitoring points

Section No.	River	Section name of monitoring side	Distance (m)
W1	Jiuyao River	Upper reaches of the drawing spot	500
W2	Jiuyao River	Low reaches of the draining spot	2000

Table 3-7-4 Statistical results of the surface water monitoring

Monitoring point No.	Item	CODcr	NH <sub>3</sub> -N	Petroleum	pH	Permanganate salt index	TP	Do
W1	Average value	8	0.85	0.03	7.54	3.9	0.48	8.4
W2	Average value	23	2.37	0.05	7.78	8.2	0.475	1.4
	Standard rate (%)	30	1.5	0.5	6-9	10	0.3	3

According to the results listed in the table, the water quality of Jiuyao River near the project site is good and better than the water quality of the Mafeng River. All the indexes can reach the quality standard of the □ water in *Environmental Quality Standard for Surface Water* (GB3838—2002) . The sewage of this project will reach standard□ (water quality is shown in Table 4-2-3) in *Comprehensive Standard of Sewage Setting* and will not deteriorate the water after being drained into Jiuyao River.

### 3.7.3 Survey and Assessment of Sound Quality

According to the characteristics of the sound sources of the project site and the condition of the surroundings, six noise-monitoring points are set around the factory. The monitoring results are shown in table 3-7-5.

Table 3-7-5 statistical results of sound quality monitoring (dB (A))

No.	Daytime	Status of reaching standard	Nighttime	Status of reaching standard
N1	46.7	Reaching	35.6	Reaching
N2	45.6	Reaching	35.4	Reaching
N3	43.9	Reaching	33.8	Reaching
N4	48.8	Reaching	35.1	Reaching
N5	44.0	Reaching	36.7	Reaching
N6	47.0	Reaching	36.4	Reaching

According to the monitoring results of table 3-7-7, the building areas are in the early period



of the development and there is no evident noise. The noises of six monitoring points in the proposed factory site are lower than 55 dB (A) in the daytime and lower than 45dB (A) at night. It belongs to silent environment and can reach standard□.

## **Chapter 4 Environmental Impacts and Alleviative Measures**

Inevitably, this project will affect the natural environment, ecological environment and social environment during the constructing and operating period. Except for the Jiuyao River which is liable to be affected, there are no other sensitive places such as nature reserves, scenic spots, cultural relics and protection units of historical relics etc. This report is mainly concerned with the environmental impacts during the constructing period, the impacts and risks to the air during the operating period as well as some alleviative measures to these disadvantageous impacts and latent risks.

### **4.1 The ecological impact analysis and measures.**

Because the main ecosystem in the project site is the croplands, the basic principle of this assessment of the impacts to the ecological environment is to reveal the impacts and see if the impacts are beyond the ecological load of the project site and if they will have great impacts to the integrity of the ecological environment according to the main function of the ecological environment, i.e. the agricultural production.

#### **4.1.1 The dust of construction period**

Digging work will destroy the structure of soil and earth's plant, produce dust .A quantity of dust not only harm the air quality, but also the respiration and grousing of surrounded plants there is no sensitive target, around, and it is adjacent to road, farmland, so the environmental impact is very little.

The concrete prevention measures as follows.

The measures for water and soil conservation as follows:

- The piling points of the abandoned soil must be arranged in the range of occupied land; it is not permitted to use the farmland, irrigating facility and area near the river. The abandoned soil must be pressed tightly in time;
- During digging the groundwork, at the soil taking and abandoned place, certain quantity of protecting goods such as oilcloth would be prepared to cover the soil for preventing soil erosion in the rainy day;
- The construction team should contact with the weather bureau, at any moment. In order to adopt necessary temporary measures. It should maintain the straightway of drainage

system;

- Choose the locations of temporary engineering such as the spots for building material piling in constructing area should be rationally; arrange them in the range of the occupied land; after construction, clean and level up the temporary land and plant trees.

#### **4.1.2 Influence on Agriculture Production and Mitigation Measures**

There is 100 mu land is needed during the construction of the project. The reduced land in all the teams will be compensated in cash.

#### **4.1.3 The Analysis on the Influence of Famous Trees and Mitigation Measures**

According to the site investigation, in the range of the project there are no old and famous trees.

#### **4.2 Analysis and Alleviative measures to the impacts to the air**

The dust produced by the transporting vehicles during the constructing period and the air pollutants of the straw burning emitted from the boiler during the operating period causes the main air pollution in this project.

##### **4.2.1 Constructing Period**

During the constructing progress, the main air pollutants are:

###### **(1) Exhaust gas**

During the constructing period, the exhaust gas mainly comes from the constructing machines and transporting vehicles, containing the pollutants such as NO<sub>2</sub>, CO and hydrocarbon etc. In addition, other exhaust gases come from fuel burning by the constructing people in daily life.

###### **(2) Dust and powder**

During the constructing period, the main powder pollutants include:

The dust produced by the building materials such as cement, lime and sand when they are blown during load, unload, transporting and piling;

The dust on the ground produced by the transporting vehicles;

The dust produced by the constructing garbage when they are piled and cleaned up.

The dust and powder mentioned above will cause the air pollution of the surrounding environment. The powder pollution during the constructing period is decided by the operating mode. The dust pollution may be caused by the way of piling the materials and especially by the wind blowing, and will bring some disadvantageous impacts to the air and the residents around the site. During the operating period, the density of the suspending grains in the atmospheric layer near the ground will be several folds or more than ten-fold of that of the usual time and will be greatly beyond the Standard in *Standard of the Air Quality*(GB3095—1996). However, due to the big diameter of the dust grains (usually more than 100 $\mu$ m), the dust flows on the ground quickly and will only affect the area around the constructing site, which is fairly small.

During the constructing period, the earthwork, the load and unload, the transportation will produce dust up into the air which will do harm to the air of the surroundings. Therefore, some feasible controlling measures must be worked out to reduce the pollution or reduce the affected areas. The main alleviative measures are listed as follows:

- There should be a rational management of the constructing sites: piling the sand and stone material together, storing the cement in a special storehouse, reducing transporting steps, carrying the materials carefully to prevent destroying the packing bags.
- Some water should be sprayed on the operating surface to keep humid and reduce dust. The constructing soil garbage must be moved in time to prevent causing flying dust after being piled for a long time or being washed by the rain.
- The transporting vehicles should be in good condition. There should be no overload and some coverings and airtight facilities should be taken to reduce the dust flying out during the transportation. The soil and building materials falling on the ground should be cleaned in time. Wash the tire. Spray water regularly to reduce the dust in the transportation.
- The enclosure should be set up in the constructing sites to reduce the range of the falling dust.
- Water should be sprayed regularly on the ground in the constructing sites. Clean the garbage in time to prevent causing flying dust and powder pollution. When the wind

speed is over 4.5m/s, constructing work should be stopped and the building material such as the sand and powder should be covered.

#### **4.2.2. Analysis of the Environmental accidents**

According to the features of this project, the emission sources, which may cause the emission accidents, are:

- (1) Malfunction of the hop-pocket dust catcher which causes the dust emission beyond the standard;
- (2) Fire in the straw storehouse.

##### **4.2.2.1. Analysis of Accidents Caused by the Hop-pocket Dust Catcher**

###### **Standard of the Emission Accidents**

During the operating period, if the hop-pocket dust catcher cannot function properly and its efficiency descends to 99%, a great number of pollutants will be emitted directing into the air. In this case, the density of the **emitted smoke and dust will be 300-1000mg /Nm<sup>3</sup>**, which is beyond the standard of GB13223—2003.

###### **Analysis of the Impacts of the Emission Accidents**

According to the predication, when the bag-house filter dust cannot function properly, the density of the emitted smoke and dust will be 300mg/Nm<sup>3</sup>, which is beyond the standard of emission density. Therefore, some effective measures must be taken to avoid the accidents.

###### **Precautions against Accidents and Emergency Measures**

Inspect regularly the hop-pocket dust catcher system and pneumatic dust remover system; ensure that all the necessary accessories function properly.

Check regularly the successive monitoring system of the smoke and dust; find out the causes as soon as possible when the smoke and dust is beyond the standard.

Reinforce the management; detect and remove the hidden trouble in time; establish and strictly carry out all kinds of regulations and rules preventing accidents.

Heighten the personnel's consciousness of preventing accidents and strengthen the emergency training after the accidents.

##### **4.2.2.2. Analysis of Fire Accidents in Straw Storehouse**

The rectangular straw storehouse with an area of about 3000 m<sup>2</sup> has a storage capacity that can ensure the boiler to work for 3 days. Central straw purchase station also has the

risk of fire. The straw is inflammable and is easy to catch fire at the slightest carelessness, especially in the seasons of high temperature. Therefore, an emergency aid team should be set up to reduce the disadvantageous impacts to the minimum. The straw storehouse is equipped with good ventilation, drying and illumination conditions as well as fire protection equipment such as fire alarming system, intelligent infrared detection equipment, spray fire extinction system and automatic fire extinguisher. The vacuum clean device is used to clean the crushed straw and straw dust to reduce the hidden fire risk and improve the safety of the storehouse.

### **Emergency plan**

The emergency plan includes the responsibility and duty of the commanding institute and relevant cooperation units, the alternatives of emergency techniques and settling modes, the allocation and disposition of the equipments, the supply and restructure of manpower and material resources, the dynamic monitoring system of accident, the information system after accidents.

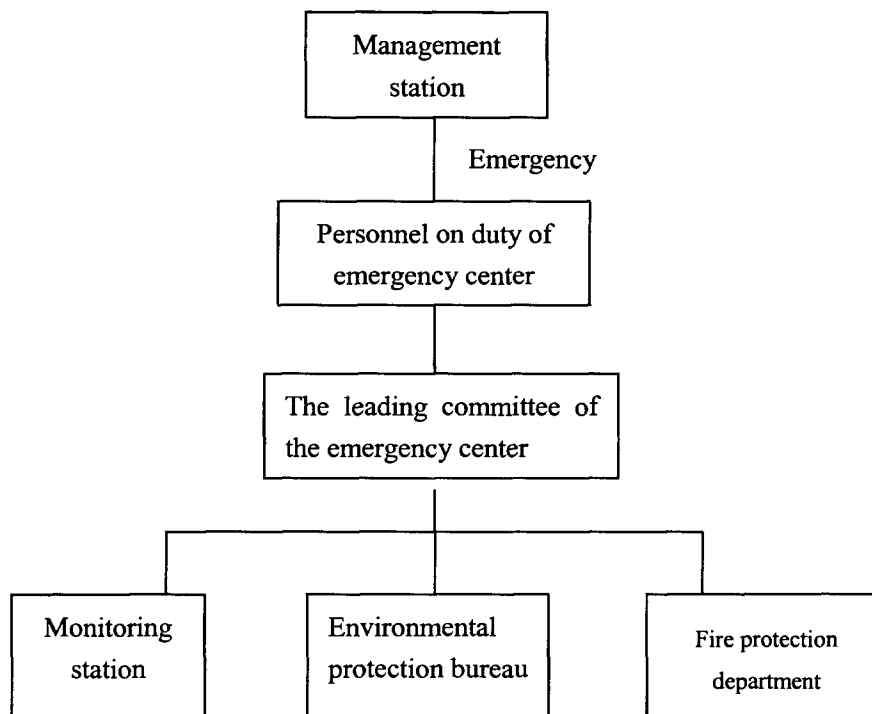
#### **A. Establish the Emergency Network, the Emergency Leading Committee; Assign the Emergency commanders**

Leaded by the Nantong Environmental Protection Bureau, the Rudong county government and other related units such as Rudong Environmental Protection Bureau, Rudong Environmental Monitoring Station and Rudong Fire Brigade establish an emergency network and an emergency leading committee. The emergency commanders are the personnel with special trainings of the power plant. The Emergency Center is equipped with special emergency telephone and duty personnel in charge of receiving calls all day long. Once there is an accident, the commanders should be informed immediately. Then they should connect with the Emergency Leading Committee according to the emergency plan and go into action.

#### **B. Emergency Disposal**

Once there is a fire in the straw storehouse, the management station should use the mobile telephone to call the emergency center. The duty personnel of the emergency center should inform the emergency commanders after sizing up the situation, and the commanders should inform the personnel of the emergency disposal team. The disposal team should get to the spot immediately and take emergency measures to prevent the diffusion of pollution and the deterioration of the danger. If the neighbors are involved, they should be evacuated immediately.

The emergency procedure graph is as figure 4-1.



**Figure 4-1 the emergency procedure graph**

C. Some equipments and facilities, including emergency safety vehicles and fire-fighting equipments, are necessary in the emergency disposal.

**Table 4-2-1 Necessary Equipments and Facilities in the Emergency Disposal**

Item	Name and Model	Quantity	Total Expense
Fire-fighting	Portable extinguisher	Twenty	12000
	Go-cart extinguisher	Twenty	16000
	Gas masks	Thirty	8000
Alarming	Mobile phones in the Management Station	One	3000
Medical treatment	First-aid kit Stretcher	Ten set	50000
	Drugstore		
Vehicles	Emergency vehicles	Two	60000
Total			683000

D. The emergency personnel should attend the environmental protection training organized by Nantong Environment Protection Bureau, which can make them have some knowledge of environmental protection and the ability to deal with the emergency.

Table 4-2-2 Training Plans of the Emergency Personnel

Training Period	Category	Number of Personnel	Training term	Time	Expense
Constructing period	Emergency Personnel	5	Two weeks	2006	4000
Operating period		10	Two weeks	2006	8000
Total					12000

#### 4.2.3 Predication and Assessment of the Impacts to the Air during the Operating Period

During the operating period, the smoke causes the main air pollution during the straw burning. The main pollutants in the smoke include soot and SO<sub>2</sub>. The project site is situated in the plain area, and the system wind is in dominance, which shows the common characters of the wind field in the plain. Therefore, this assessment and predication mode adopts the wind-diffusion mode and breeze-diffusion mode commended by Assessment Regulation of Environmental Impacts in China (HJ/T2.2-93) to calculate the density of NO<sub>2</sub>, PM<sub>10</sub> on the ground level of the site (including the hourly average density and daily average density).

According to the calculation in this mode, on the condition of atmospheric stability, the hour density of NO<sub>2</sub> on the largest spot is 80.16 μ gms/Nm<sup>3</sup>, which accounts for 33.4% of the standard [standard: 240 μ gms/Nm<sup>3</sup> hourly, 120 μ gms/Nm<sup>3</sup> daily and 80 μ gms/Nm<sup>3</sup> annually, see Table 1-11-1 Ambient Air Quality Standard (GB3095-1996)]; the maximum daily density of NO<sub>2</sub> and PM<sub>10</sub> is 0.0058mg/m<sup>3</sup> and 0.0008 mg/m<sup>3</sup> respectively, which accounts for 4.83% and 0.53% respectively [standard: 0.12 mg/m<sup>3</sup> and 0.15 mg/m<sup>3</sup>, see: Table 1-11-1 Ambient Air Quality Standard (GB3095-1996)]. According to the statistics above, the environmental impacts of the air pollutants in the project are limited. The detailed alleviative measures are listed as follows:

- Highly effective hop-pocket dust catcher will be put into use in the project. Its efficiency is 99.9% and the smoke and dust emitted will reach the standard with it.
- The impacts of the smoke and dust out of the 100m-high chimney to the surrounding environment will reach Standard □ of *Emission standard of Air Pollutants for Power Plants* (GB13223-2003) and that of *Ambient Air Quality Standard*;

#### 4.3 Assessment of Water Environmental Impacts and Alleviative Measures

During the constructing period, the water pollution is mainly caused by the life wastewater produced by the constructing personnel. During the operating period, there is a small quantity of producing and life wastewater. Some of the alleviative measures that would be adopted to reduce the impacts are presented below:



#### 4.3.1 Constructing Period

During the constructing period, it is inevitable that there will be slurry water after the washing of equipments and the life wastewater of the constructing personnel. Although the wastewater is not in large quantity, it could cause environmental pollution if it is not disposed or not disposed properly. Therefore, the wastewater produced during the constructing period should not be drained randomly. The main alleviative measures are as follows:

- Reduce material losing, dispersing and overflowing; reduce the production of wastewater;
- Pile the building materials such as cement, yellow sand and lime together and take some necessary rainproof measures; Clean the materials falling on the ground in constructing progress to make them easily washed into the sewage treatment facilities;
- Build the temporary lavatory with septic tank, and the wastes will be collected regularly by local department of city environment and sanitation to designated places for disposal;

During the constructing period, the main garbage is the building garbage and the life garbage of the personnel.

The building garbage should be cleaned up and put into use in time to avoid causing flying dust after being piled up for a long time. If the life garbage is not cleaned up and disposed in time, it will rot, make mosquitoes and flies propagate, produce odor and spread diseases, which will do harm to the surroundings and the health of the personnel.

#### 4.3.2 Operating Period

After the project is put into production, the main wastewater includes circulation water, sewage, acid and alkali wastewater, industrial wastewater and life wastewater etc. According to the rule of "one water, many usages", the industrial water after being disposed will be used as circulation supplying water, the sewage out of the boiler and the acid and alkali wastewater will be drained into the Jiuyao River after being disposed and reaching the drain standard (see Table 4-2-3); the life wastewater will be used as the irrigating water of the greens in the factory after the biochemical disposition.

Sewage of the power plant must reach the standard of *Wastewater Discharge Standard*(GB8978—1996)before it is drained (See table 4-2-3). According to the

predication, the drain situation and the draining water quality are described in figure4-2-3.

Table 4-2-3 Predication of the draining water quality

Wastewater Name	Discharging mode	Pollutant	Concentration before disposal mg/L	Disposal method	Concentration after disposal mg/L
acid and alkali wastewater	intermit	COD	100	neutralization	30
		pH	2~4		7~8
Industrial wastewater	Continuous	SS	1000	Sedimentation and clarification	10
Life wastewater	intermit	COD	350	Sedimentation and oxidation	70
		BOD <sub>5</sub>	200		10

Detailed alleviative measures are as follows:

- The condenser of steam turbine, dynamotor and oil cooler should adopt the cycle mode of cooling water. The circulating draining sewage is harmless clean water and will be used as industrial water after cooling.
- The acid and alkali wastewater will be neutralized after being drained into the neutralization pool, and will be drained into Jiuyao river when their pH is 6.5-8.5.
- The industrial miscellaneous water will flow into the recycling pool after the disposition and will be used as the complementary water for the circulating water.
- The sewage out of the boiler will reach the National Standard□after being cooled in the cooling pool and will be drained into Jiuyao River.
- The life sewage will reach the National Standard□after the grade-2 biochemical disposition and will be used to remove the dust and green the factory. (See section 2.6.2(5))

#### 4.4 Analysis of Noise Impacts and Alleviative Measures

##### 4.4.1 Constructing Period

During the constructing progress, the operation of all kinds of constructing machines and the moving of all kinds of vehicles will cause noise pollution inevitably. The noise of the constructing machines is high. In the construction, all the machines always work at the same time and the radiant sound powers of all kinds of noise sources are strengthened by each other, which will make the noise lever higher and radiating area larger.

The calculation formula of a single noise source is as follows:

$$L = L_0 - 20 \lg \frac{r}{r_0}$$

L in the formula is the noise level of the place r away from the noise source, dB(A).

The adding of the impacts of two noise sources on the same point is calculated in the following formula:

$$L_{1+2} = 10 \lg \left[ 10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} \right]$$

According the calculation, when the noise level of the constructing equipment is 120dB (A), the impact degree of the spot in the distance of 500meter is 66.0dB (A); when the noise level of the constructing equipment is 115dB (A), the impact degree of that spot is 61.0dB (A); when the noise level of the constructing equipment is 110dB (A), the impact degree of the spot is 51.0dB (A). In allusion to the situation above, the following measures can be taken to reduce the noise impact t to the surroundings in the constructing period:

Intensify the constructing management; forbid the operation with high noise at night;

- Place the fixed constructing machines at the location where the minimum impact is caused to the surroundings;
- When the continuous pouring operation of concrete is necessary, al the preparations should be made before the operation to reduce the operating time of the mixer.

Besides the noises generated by the machines mentioned above, the running of all sorts of transporting vehicles during the constructing period would increase the noise level at the

sensitive point. Therefore, the management of transporting vehicles should be reinforced: the whistle by the vehicles should be in control; the vehicles should be dispatched properly to reduce the quantity of the vehicles and running density in the constructing area.

#### 4.4.2 Operating Period

The main noise sources in this project are in the main workshop and blower room. The equipments with high noise are steam turbine, dynamotor, exciter, coagulating water pump, shooting water pump, electronic feed water pump, blower and drawing blower etc. The noise of the main equipments in the project sees the table 4-4-1.

Table 4-4-1 the noise degree of the main equipments unit: dB (A)

No	Equipment	Noise level	Quantity
1	Generator	90	1
2	Steamer	90	1
3	ID and FD fans	85	1
4	Cooling tower	95	1
5	Circle water pump room	85	1
6	Main transformer	75	1
7	The empty pressure work room	90	1
8	Exhausting boiler*	<120	1

By calculating and forecasting, the noise lever could reach the standard □ in the *Standard of Noise at Boundary of Industrial Enterprises (GB12348-90)*.

Table 4-4-2 the forecasting results of boundary noise

No.	Daytime				Nighttime			
	Background value	Effect value	Forecast value	Standard value	Background value	Effect value	Forecast value	Standard value
N1	50.4	40.1	50.8	55	38.9	40.1	38.9	45
N2	47.0	40.3	47.8	55	38.9	40.3	42.6	45
N3	42.8	39.7	45.0	55	38.4	39.7	42.1	45
N4	51.0	39.4	51.2	55	38.6	39.4	42.0	45
N5	43.6	39.6	45	55	40.0	39.6	42.8	45
N6	45.9	39.2	46.7	55	37.5	39.2	41.4	45

The main job of this forecast is to calculate the impacts of the main noise sources on the monitoring points on the border of the factory and get the adding results of the predicted impacts

that will be added to the status monitoring results to predict the noise impacts to the border of the factory. With the formula recommended by *Technical Regulations of the Environmental Impact Assessment* of P.R.C., the calculating results are shown in the figure 4-4-2. The impacts of the main noise sources in the factory on the status monitoring points can reach the requirements of type-1 standard of *Noise Standard on the Border of the Factory or Enterprise* (GB12348-90).

In this project some alleviative measures are taken as follows:

- Install double- layer noise insulating windows and doors in the control room of the machines and the boiler and main control room. Equip the indoor ceilings with the noise absorbing material.
- Install noise insulating layer and heat preserving layer on the boiler and drawing blower.
- Install the muffle on the exhaust pipe to the air of the boiler.
- Present the requirements of limiting the noise of all the equipments that may be the noise sources when they are ordered.
- In the design of the whole layout of the plant, the buildings causing great noise should be settled in the center of the plant area and be away from the plant border to reduce the industrial noise impact of the power plant on the surrounding environment.
- Enhance the greening program in the plant area to beautify the environment, insulate noise and remove dust.

#### **4.5 Analysis of the Impacts of Land Requisition and Alleviative Measures (reason of site change is described in detailed in section 1.4)**

The proposed site situates in the brick factory of Mingxing Construction Materials Company which has been closed and the land there belongs to the idle construction land without involving resettlement and rehabilitation and compensation. Compared with the original site, the new site enjoys a number advantage. Moreover, it is a subproject of CRESP. In order to ensure the scheduled process of the project, no alternatives, including alternative sites, alternatives fuels and alternative power generation schemes, had been considered. The change of the site meets the national industry policy and is a reasonable allocation of land which can optimize the land resources.

#### **4.6 The Analysis of the Social Impacts and Alleviative Measures**

This project will bring some social influence; the positive aspect is as follows:

- This project affords a new way to develop the large-scale utilization of straw resources of our country;
- This project is an important supplement to the energy of Jiangsu province, which can promote the social economic development and improve people's living standard;
- The project of generating electricity with straw in some degree can take the place of the coal power plant. Effective utilization of straw is a proper measure to improve the life standard of the farmers;
- The fuel of this project is renewable and therefore is harmless to the surrounding environment.

On the other hand, the project may affect the social environment in the following aspects:

The land expropriation and resettlement will affect the people's life. During the constructing period, the present traffic would be influenced and there would be more jam phenomenon. The construction may affect the irrigating facility in the farmland; in addition, wastewater, dust and noise may impact on the surrounding environment. With the following measures, these impacts could be alleviated.

- Before construction, the constructing border should be regulated to ensure that the construction is within the range of expropriated lands. Working outside the border would be prohibited and it wouldn't be permitted to do damage to the vegetation and buildings beyond the border. Once this happens, local government will rationally compensate for the affected people;
- During construction period, the construction unit must enhance the protection of the irrigating facility in farmland, and ensure that the facility runs smoothly. It would be forbidden to pile the constructing materials into the agricultural drainage channel, and to dump the waste soil and stone into the irrigation and drainage channel;
- The smoke cleaning equipment should be checked periodically and the maintenance of the purifying equipment should be enhanced in the daily operation.

#### **4.7 Construction Management**

According to the arrangement of the construction, most of the constructing personnel will

be accommodated temporarily in the local private houses. In the building site, we will set up 3 or 4 accommodation spots where the temporary lavatory with septic tank should be built to dispose the life wastewater. The wastes will be collected regularly by local department of city environment and sanitation to the designated places for disposal. The life garbage should be stored together and cleaned by the public sanitation department periodically. In addition, the drinking water should accord with the healthy standard.

A public bidding will be hold to choose the contractor of this project, who should have abundant construction experience and will establish every kind of regulations under the owner's supervision. All the personnel should be trained and the training includes environmental management, daily constructing safety, noise management, dust management, accommodation areas management and occupational health education. In addition, environmental management and measures will be included in the contract of the contractor. Besides the owner, the environmental personnel, including the environment supervising expert, will be assigned by the local government to supervise the construction.

#### **4.8 Road traffic caused by straw transportation**

The road transportation in the area of straw resource is well developed. There are three main roads from the main straw storage facilities to the plant. One is provincial road NO. 223 which is 28m wide. The other two are Second class highway No.317 which is 15m wide and a costal road which is 7m wide. The potential accidents caused by narrow roads and dangerous turnings are few. Based on the straw demand of the plant, main traffic flow is estimated as follows:

- (1) One delivery of a lorry:  $36 \text{ bales/ lorry} \times 400\text{kg} = 14.4 \text{ tons}$
- (2) Daily deliveries to the plant:  $500 \text{ tons (daily fuel demand)} \div 14.4 = 34.7$
- (3) Deliveries per hour to the plant:  $34.7 \div 16 = 2.16$

Three drivers will be set for each lorry and they work in shift during the whole driving hour of 16. Therefore, they will not be tired and the rate of potential accidents is low.

Straw transportation will be limited during the period from 6 A.M. to 10 P.M., which will not cause considerable impact caused by traffic noise on local people .

#### **4.9 Environmental Benefits**

This project will bring some environmental benefits and positive influences. Rudong County is short of unrenewable energy resources such as coal, oil or gas and there is no water

resource at all. The supply of energy wholly depends on import from the other areas. Straw is a biological energy resource, which is renewable. There will be an evident energy-saving effect to use the biological energy to take place of the fossil fuel for generating power. The project of generating energy can save 70,000 tons of standard coal per year, and accordingly reduce the SO<sub>2</sub> by 1,112 tons and CO<sub>2</sub>, the greenhouse gas by 150,000 tons. Therefore, the environmental benefit is tremendous.

#### **4.10 Other Assessment Standards**

Besides OP4.01, the World Bank has other nine standards to protect the natural and social environments. After checking and analyzing the sites, the environment assessment team has reached the following conclusions:

- In the project site, there is no rare wild animals or nature reserves that should be protected, so no assessment on natural habitat has been made;
- According to the initial inspection by the assessment team, there is no aboveground cultural relics on the project site, so the report makes no assessment on cultural properties; **(see attachment: Certificate provided by Rudong Culture Bureau)**
- There is no settlement area of minorities around the project site, so no assessment on aboriginals has been made;
- There is no forest around the project site, so it is not necessary to make assessment on forests and the control of plant diseases and insect pests;
- The project site involves no controversial area or international watercourse or dam, and relevant standards are not applied to.



## Chapter 5 The public Participation and Information Disclosing

Any project construction will bring about beneficial or disadvantageous influences on the natural environment or the social environment, and will affect the public benefits in neighborhood directly or indirectly. Starting from their own benefits, the public will hold different attitudes to the project. The public participation in the evaluation of the environment influences is to make the public survey in the evaluation in order to know the attitudes and views of all social circles.

The aim of the public participation is to know the public attitudes to the project construction, the scope of the influences on the society, economy and environment so that the evaluation of the environmental influences can be democratic and open.

According to the requirements of the World Bank and the State General Bureau of Security and Protection, a survey of relative people at the project site and ambient sensitive regions was conducted by means of questionnaires from June 20, 2006 to June 30, 2006.

### 5.1 The Results of the Survey

The requisitioned land was the land used by the brick factory of the Mingxing Construction Materials Company Ltd. which has been closed. Therefore, there are not dismantlement, resettlement and compensation of the farmers. The inquisition personnel hand out the questionnaires to 50 people within the scope of influences by the project. People participating in the survey are from various strata of the local society, who are very representative. Various means have been adopted in the survey, such as colloquia questionnaire and interview questionnaire. The composing proportion of the public is on table 6 and the statistical results are on table 5-1-1.

Table 5-1-1 General Information about the Citizens Involved

Item		Number of people	Percentage ( % )
Number of people in the survey	Male	34	68
	Female	16	32
	Total	50	100
Age	<30	17	34
	30-45	23	46
	45-60	8	16
	>60	2	4
Education degree	Primary school	8	16
	Secondary school	28	56
	High school	14	28
Occupation	Worker	23	46
	Farmer	27	54

Table 5-1-2 the Statistics of the Public Survey

Serial number	Question	The percentage of the answer (%)		
		(1)	(2)	(3)
1	Do you agree to fire straw in the field in your region? : (1) Yes (2) No (3) Do not mind	19	72	9
2	Do you think building such an electric plant in your region could reduce environment pollution? (1) Yes (2) No (3) Do not know	85	9	6
3	What do you think is the major environmental pollution? (1) SO <sub>2</sub> (2) Water pollution (3) Dust pollution	28	37	35
The influence in the constructing period				
4	During the construction period, which do you think affects your life most: (1) Noise (2) Dust (3) Transportation interference	55	28	17
5	Do you want the constructing personnel to rent the house of the people in your village: (1) Yes (2) No (3) Do not mind	78	12	10
6	In the constructing period of the plant, which do you think must be most concerned in regarding to safety: (1) The safety of temporary electricity using (2) Children playing on the road (3) The velocity of the constructing vehicle	15	70	15
7	In the plant constructing period, it will affect your income or not: (1) Increase the income (2) Reduce the income (3) No influence	50	4	46
The influence in the running period				
8	After the electric plant construction, the vehicle flux will increase, which aspect will affect your life: (1) Vehicle noise (2) Water pollution (3) Dust	70	13	27
9	Do you think the plant construction will affect the surrounding environment: (1) Too greatly (2) Not greatly (3) No influence	9	52	39
Other main opinions and requirements of the public				

11	<ol style="list-style-type: none"> <li>1. To employ local farmers to participate in the project construction so as to increase their income;</li> <li>2. To enhance the environmental protection investment, to enhance the environment supervision and inspection by the government administrative departments;</li> <li>3. To do the best to prevent pollution in constructing period, the existing environment can not be damaged;</li> <li>4. To enhance the environmental management; control the emission of pollutants.</li> </ol>
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### 5.2 Reply to the Questions that the Public are concerned with

In the survey, the assessment team found that the local people will support the project construction positively, and hope the project be completed as soon as possible. They have a good understanding of the impacts on environment, among which noise and dust of the electricity plant are the main pollutions of the construction. In the consultation, they put forward some environmental and social questions that they are concerned with. The assessment team together with the design institute studied these questions carefully and brought about in this report the measures that will be taken. The replies to the questions are as follows:

(1) Employing the local labor force

The public and local government requests that local farmers should be employed to participate in the project construction so as to help increase their economic income.

Solution: During the construction period, the construction company will employ a certain number of local workers. After the technology training, they could participate in the construction and get their pay for it.

(2) No getting earth from farmland

The public request: Do not get earth from the farmland

Solution: Serious considerations should be taken about the spots of taking and abandoning earth in the design, and land beyond the requisition can't be occupied. And the preservation of soil and water should be strengthened at the places of getting and abandoning soil during and after the construction. The relative regulations must be written down in the bidding documents and be enforced into implementation.

(3) Traffic problems

The public request: During the construction period, the current traffic should not be influenced and the resident traffic, children schooling and patient hospitalizing have to be kept in good condition

Solution: During the construction period the building unit will set up an alarm signal at the intersection between the 317 Line and central road in the village, warning the people of the traffic danger. At the same time the vehicle drivers will be provided with safety education and be forbidden driving at high speed so as to ensure the safety of the pedestrian and other vehicles.

(4) The impacts on the irrigation system and rivers.

The public request: During the constructing progress, agricultural irrigating system should not be damaged and the normal irrigating work of the farmland should not be affected.

Solution: Before construction, the contractor and constructing personnel must accept certain education, and be requested to protect the existing irrigation facilities in the constructing progress, ensure these facilities running smoothly, and prevent the constructing material piling in the field channel and dumping the earth and stones into the drainage channels.

**5.3 Information Disclosing**

The environmental impacts assessment report and the environmental management plan report will be open to the public after completed. The information will be disclosed as follows (see table 5-3-1):

Table 5-3-1 the Time, Site and Mode of information publicity

Time	Site	The ways of information disclosing
September 2006	Bulletin board of Rudong People's Government	Proclamation
September 2006	Bulletin board of Juegang People's Government	Proclamation
September 2006	The First floor of Qingyuan Mansion in Juegang Town	Proclamation

## Chapter 6 Conclusions

According to the project's environment impact assessment, we get the main conclusions as follows:

### 6.1 Existing Environmental Assessment Conclusions

- This project is located at the Juegang town of Rudong County, Jiangsu province, where have no own electrical power supply and the electric network of Jiangsu province provides all power force. The power shortage of Jiangsu province has hindered the economic development of the Rudong County to a certain extent. The proposed project could relax the tense situation of local power force supply and promote the local economic development;
- The location of this project is idle land; and there is no rare species;
- There is no culture relics and historic site near the location;
- The land-cover is good and there is no soil erosion;
- The local air quality of the project is good; the monitoring results of SO<sub>2</sub>, NO<sub>2</sub>, and PM<sub>10</sub> are all superior than the requirement of the air quality standards;
- The main water body of this project is Jiuyao River. The water quality can meet the requirement of national standard III;
- The location of this project is in rural area, and the noise level meets national standard I. It is a quiet area.

### 6.2 Environmental Impact Assessment Conclusions

- The proposed project may put some impacts on the water environment of Jiuyao River. This report has brought about some scientific measures to decrease the impact and emergence plan to deal with accident, so that environmental impact of this project could be reduced to the minimum degree;
- The proposed project may put some impacts on atmosphere environment. This report

has brought about some scientific measures to prevent air pollution, so that the emission of air pollutants could meet national standard;

- During construction period, the surrounding residents with the range of 200m may be influenced by construction noise. When it is in run, there is no noise pollution.
- During construction period, some plant in the construction site may be destroyed and lead to a little soil erosion. When this project finished, many proper measures will be carried out and soil erosion will be completely controlled;
- Under proper management, the life wastewater and garbage in the construction site will be dealt with and will not influence the surrounding;
- After the project is starting, the project can both solve the problem that the straws of surrounding crops is hard to deal with, and increase the farmers' income, so the project can obtain extensive environmental benefit.

The construction of the project generating electricity with straws in Jiangsu Province can not only solve the problem that the straws is hard to deal with and the air pollution resulted from straw burning in harvest season, but also increase the farmers' income. In the other hand, the straws for electricity generation have many advantages that it can replace the standard coal 70,000 t/a reduce the SO<sub>2</sub> emission 1122 t/a and CO<sub>2</sub> 15×10<sup>4</sup> t/a, and add electricity 20000×10<sup>4</sup> KWh. So this project will in some degree smooth the strain of electricity supply, and create considerable economic benefits, and improve the life quality of local residents in some degree. Its environment impacts can be reduced to the minimum through proper method. So this project gains the positive support of the mass and the local government.

## Chapter 7 Environmental Management Plan

### 7.1 The Structure of the Environmental Management Plan

#### 7.1.1 The Plan of the Environmental Protection Measures

The plan of the environmental protection includes a series of measures that will be adopted during the design, construction and operation period. The plan aims at alleviating or eliminating the impacts of the proposed project on the environment, and it includes the environmental management and the environmental supervision plan during operation period.

#### 7.1.2 The Environmental Supervision Plan

This plan is to supervise the implementation of the measures of environmental protection during every stages and the realization of the environmental goal.

#### 7.1.3 The Environmental Monitoring Plan

The plan aims at monitoring the environmental performance of the project, approving the forecasting of the environmental impact assessment, identifying the unexpected influence so as to design and implement new countermeasures. For the management procedures of the environmental protection in the project of generating electricity with straw in Rudong, Jiangsu Province, see figure 7-1.

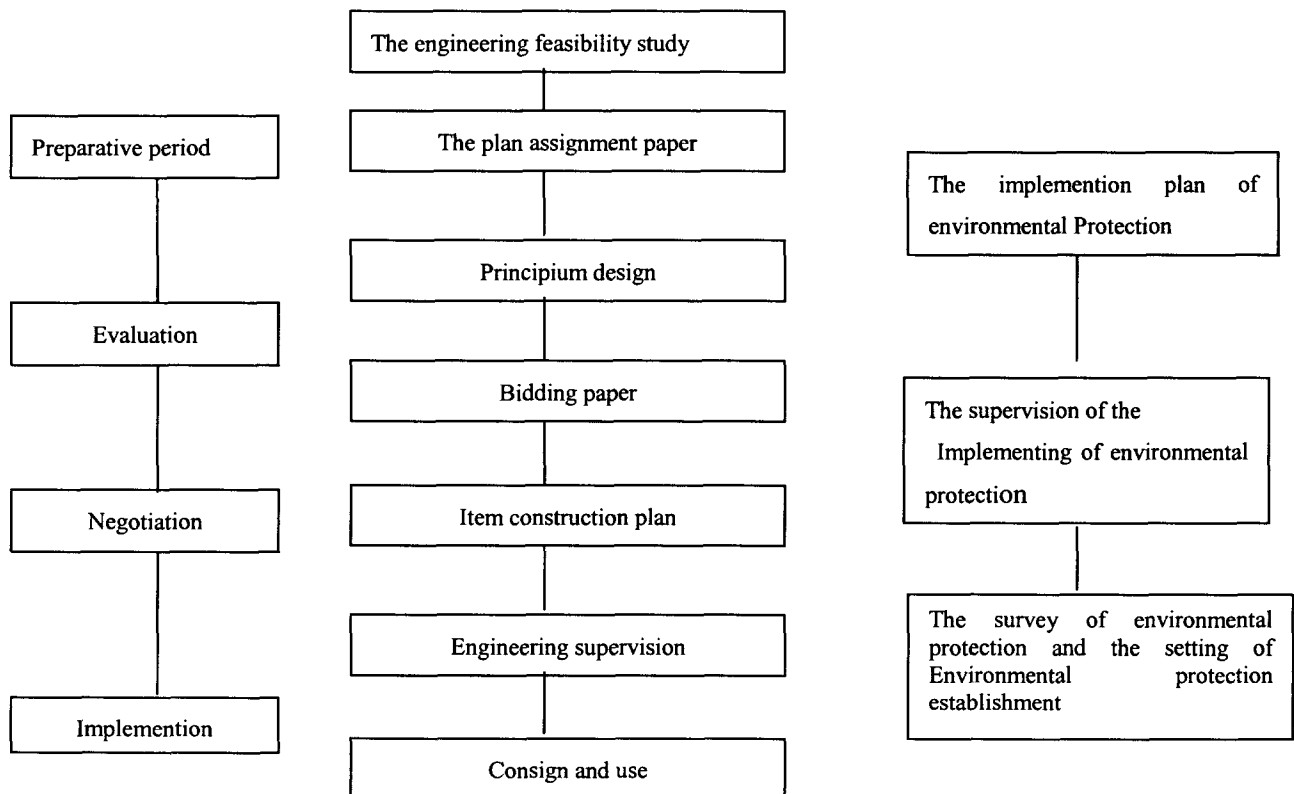


Figure 7-1 The Management Procedures of the Environmental Protection

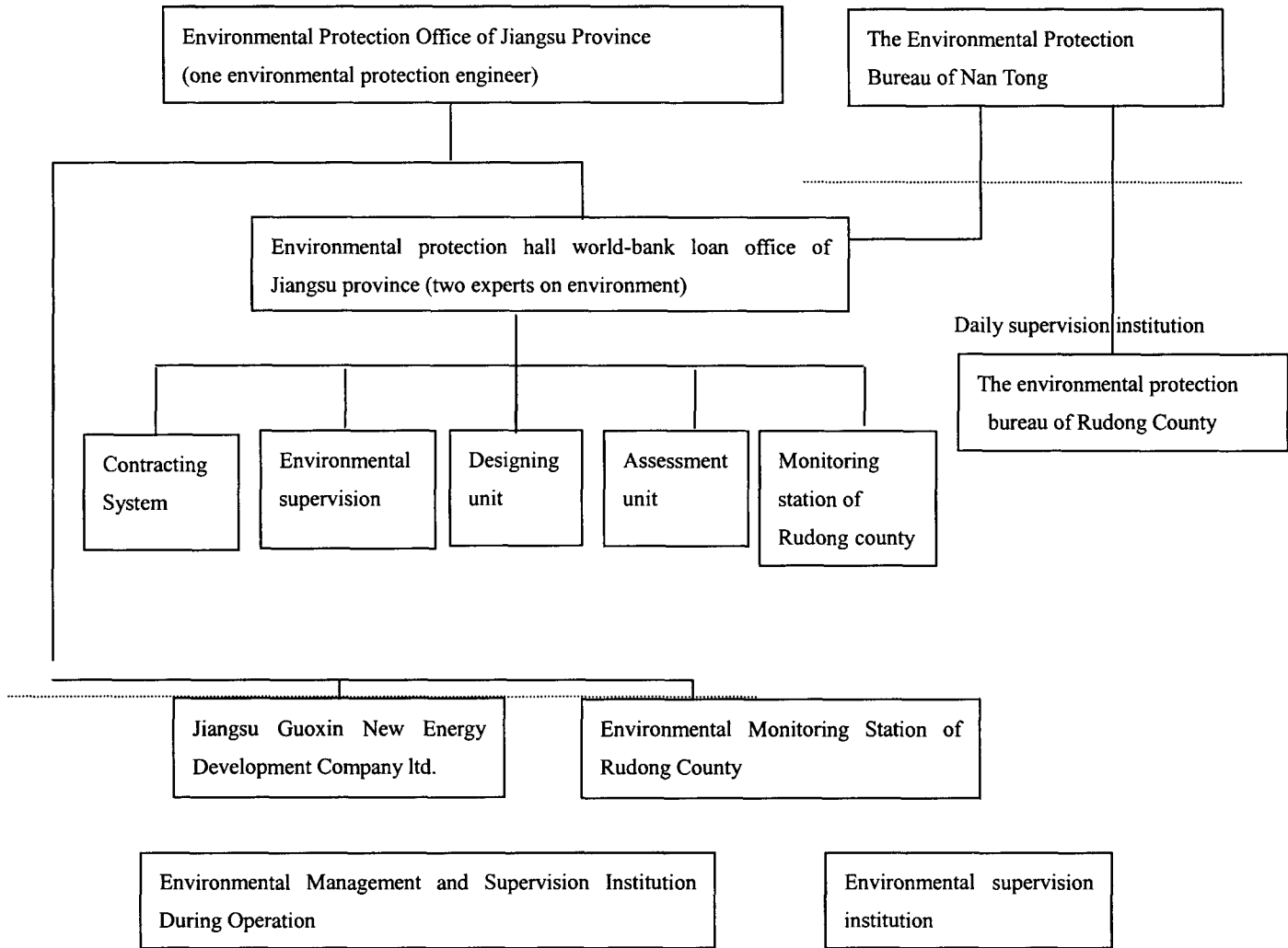
### 7.2 The Institutions of Environmental Management

During construction and operation, the government and various special institutions should be included in the environmental management plan of the electricity plant project. The structure of environmental management institutions is shown in figure 7-2.

The institution of environmental management

and implementation during design and construction

supervision institution



**Figure 7-2 The Sketch of the Environmental Management and Supervision Institutions**

From the above figure we can see that the institutions can be teamed into management institution and supervising institution according to their functions. The composing and functions of the two institutions are shown respectively in table 7-2-1 and table 7-2-2.



Table 7-2-1 Institutions of environmental management

Name	Function	Remark
World Bank Loan Office of the Environmental Protection Department, Jiangsu Province	Responsible for project design and environmental protection management during construction period	Having one fulltime environmental protection expert who is responsible for the implementation of the environmental management plan and monitoring plan
Jiangsu Guoxin New Energy Development Company ltd.	Responsible for the implementation of Environmental protection measures and management during construction and operation period	Having one fulltime environmental protection person
Environmental Monitoring Station of Rudong County	Undertake the job of environmental monitoring during construction and operation period	

Table 7-2-2 Institutions of Environmental Management Supervision

Name	Function
The Environmental Protection Bureau of Nantong city	<ul style="list-style-type: none"> <li>● Supervise the construction unit to implement the environmental plan</li> <li>● Implement relative codes and standards about environmental management</li> <li>● Harmonize every department in environmental protection</li> <li>● Monitor and supervise the construction and completion of the environmental protection facilities and their operation</li> </ul>
The Environmental Protection Bureau of Rudong County	<ul style="list-style-type: none"> <li>● Assist the Environmental Protection Bureau of Nantong in doing daily supervision</li> </ul>

### 7.3 The Environmental Management Plan

#### 7.3.1 The Plan of Environmental Protection Measures

During the process of the design of project, the design unit has tried their best to decrease the impacts of the plant on the environment and has put forward some measures for the environmental protection. Moreover, according to the analysis and assessment of the possible environmental impacts produced during the construction and operation, the assessment team has also proposed measures in the reports of EIA as to decrease the environmental impacts during construction and operation. All the above measures have been approved and supported by Jiangsu Development and Reform commission and Jiangsu Guoxin New Energy Development Company ltd. Jiangsu Guoxin New Energy Development Company ltd. will mainly be responsible for the fulfillment of these measures.

The details of the activity plan of the environmental protection measures are shown in figure 7-3-1.

Table 7-3-1 Plans of the Environmental Protection Measures

Environmental problem	Measures taken or to be taken	Implementing institution	Institution responsible
Period of Design			
Noise	<ul style="list-style-type: none"> <li>Corresponding measures of sound insulation and noise decrease have been designed</li> </ul>	Design units; Environmental assessment units	Development and Reform Commission of Jiangsu Province; Jiangsu Guoxin New Energy Development Company Ltd.
Pollution of the surface water	<ul style="list-style-type: none"> <li>Pool for the cycling of cooling water has been designed;</li> <li>Take tree planting and grass seeding into consideration as to prevent and control soil erosion</li> <li>Use the sewage disposing system of the plant to dispose the waste water to meet the standard</li> </ul>	Design units; EIA units	Development and Reform Commission of Jiangsu Province; Jiangsu Guoxin New Energy Development Company Ltd.
Air pollution	<ul style="list-style-type: none"> <li>Having considered using smog filter, and the impacts of flying dust and other problems on the environmental sensitive points have also been taken into consideration</li> </ul>	Design units; Environmental Assessment units	Development and Reform Commission of Jiangsu Province; Jiangsu Guoxin New Energy Development Company Ltd.
Cultural relics and historic site	<ul style="list-style-type: none"> <li>After site investigation, it has confirmed that there is no cultural relics and historic sites ( see attachment ).</li> </ul> <p>If cultural relics are accidentally uncovered during excavation or any other construction activity (chance fine), all work will be stopped until the Rudong Culture Bureau has investigated the site and provides official authorization for the work to continue. No unauthorized removal of artifacts is permitted.</p>	Design units; Environmental Assessment units	Development and Reform Commission of Jiangsu Province; Jiangsu Guoxin New Energy Development Company Ltd.
Aftercare of occupying the estate and dismantling the buildings	<ul style="list-style-type: none"> <li>Decrease the amount of the estate to be occupied and buildings to be dismantled during the design</li> <li>Set up resettlement Office to make plans of resettling the people and other necessities, and really ensure the fulfillment of each policy concerned</li> </ul>	Design units; Environmental assessment units	Development and Reform Commission of Jiangsu Province; Jiangsu Guoxin New Energy Development Company Ltd.
Risk and Accident	<ul style="list-style-type: none"> <li>Establish a commanding team to meet any emergency, and take charge of</li> </ul>	Design units; Environmental	Development and Reform Commission of Jiangsu

Environmental problem	Measures taken or to be taken	Implementing institution	Institution responsible
	implementing the controlling of direct emission of smog when the smog filter can't work, and make detailed plan to cope with the emergency	assessment units	Province; Jiangsu Guoxin New Energy Development Company ltd.
Environmental problem	Measure taken or to be taken	Implement institution	Institution Responsible
Design period			
Restore the places in which soil have been dug or piled up	<ul style="list-style-type: none"> <li>When choose the places in which soil have been dug or abandoned, the places have to be within the signed factory, not in the farmland beyond the signed terra.</li> <li>Set up a wall to avoid soil erosion resulted from rainwater, and level off and greening the places in which soil has been dug or abandoned</li> </ul>	Design units; Environmental assessment units	Development and Reform Committee of Jiangsu Province; Jiangsu Guoxin New Energy Development Company ltd.
Construction period			
Construction management and construction encampment	<ul style="list-style-type: none"> <li>Development and Reform Committee of Jiangsu Province will assign a fulltime person to carry out the construction management in the constructing spot</li> <li>Development and Reform Committee of Jiangsu Province will offer the training of environment for contractors</li> <li>Simple lavatory with septic tank will be set up in the construction encampment; Life garbage and construction garbage will be periodically disposed by Rudong Environmental Sanitation Department</li> </ul>	Contractor	Development and Reform Committee of Jiangsu Province; Jiangsu Guoxin New Energy Development Company ltd.
Prevention and control of the soil erosion	<ul style="list-style-type: none"> <li>Keep in touch with the weather department during the groundwork; at the soil taking or abandoning place, certain quantity of protecting materials such as oilcloth prepared to cover the soil for preventing soil erosion in rainy days or soil depositing in time.</li> </ul>	Contractor	Development and Reform Committee of Jiangsu province; Jiangsu Guoxin New Energy Development Company ltd.
Restoration of vegetation	<ul style="list-style-type: none"> <li>Restore vegetation destroyed by the construction within 15 days after the completion of construction.</li> </ul>	Contractor	Development and Reform Committee of Jiangsu province; Jiangsu Guoxin New Energy Development Company ltd.
Surface water	<ul style="list-style-type: none"> <li>Keep the construction encampment and</li> </ul>	Contractor	Jiangsu Guoxin New Energy

Environmental problem	Measures taken or to be taken	Implementing institution	Institution responsible
Pollution	<p>the piling places of building materials as far as possible away from waters; setup simple lavatory</p> <ul style="list-style-type: none"> <li>● Prevent machines from leaking oil and the transporting ships from dumping oil into the river to induce water pollution;</li> </ul>		Development Company ltd.
Environmental problem	Measure taken or to be taken	Implement institution	Institution responsible
Construction period			
Air pollution	<ul style="list-style-type: none"> <li>● Use airproof trunk to transport dregs with dust from Construction</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company ltd.
Noise	<ul style="list-style-type: none"> <li>● Construction in daytime and forbid the construction with loud noise at night</li> <li>● When entering the center road, the trunks should slow down and are not allowed to beep</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company ltd.
Irrigational system	<ul style="list-style-type: none"> <li>● Avoid earth and block from entering the irrigation and drainage system beside roads</li> <li>● Forbid piling construction materials in the irrigation and drainage system</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company ltd.
Traffic disturbance	<ul style="list-style-type: none"> <li>● Strengthen the management of construction</li> <li>● Before construction, government institutions should inform the related units along the line so as to make better arrangement about their traffic;</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company ltd.
Cultural relics	<ul style="list-style-type: none"> <li>● Strengthen the education of construction personnel, especially on the identification ability of cultural relics. If cultural relics are accidentally uncovered during excavation or any other construction activity (chance fine), all work will be stopped until the Rudong Culture Bureau has investigated the site and provides official authorization for the work to continue. No unauthorized removal of artifacts is permitted.</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company ltd.
People's health	<ul style="list-style-type: none"> <li>● Strengthen the education of construction personnel. Hold the special subjects</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company ltd.

Environmental problem	Measures taken or to be taken	Implementing institution	Institution responsible
	<p>about disease spreading in the residential area. Undertaker to provide medical examination for construction personnel in their spare time; improve the health condition of those working in the places with high noise and much dust;</p> <ul style="list-style-type: none"> <li>● Periodical medical examination for all construction personnel during construction</li> </ul>		
Society impacts	<ul style="list-style-type: none"> <li>● Set up the construction boundary before construction and forbid constructing beyond the boundary</li> <li>● If the vegetation and buildings beyond boundary are destroyed, the owner should be compensated for according to policy and codes.</li> <li>● Strengthen farmland protection and ensure the smooth working of water conservancy facilities.</li> </ul>	Contractor	Jiangsu Guoxin New Energy Development Company Ltd.
Environmental problem	Measures taken or to be taken	Implement institution	Responsible institution
Operation period			
Atmosphere	<ul style="list-style-type: none"> <li>● Adopt the bag-house filter to remove the smog, whose the efficiency is higher than 99.9%</li> <li>● Keep the bag-house filter in good condition with regular check and strict management</li> <li>● Devices should be set up in the places for temporarily piling ash dregs to prevent wind from blowing dust</li> </ul>	Jiangsu Guoxin New Energy Development Company Ltd	Jiangsu Guoxin New Energy Development Company Ltd.
Water	<ul style="list-style-type: none"> <li>● Set up the industrial wastewater treatment station</li> <li>● Set up the secondary biological treatment plant</li> <li>● Increase the recycle utilization rate of wastewater</li> </ul>	Jiangsu Guoxin New Energy Development Company Ltd	Jiangsu Guoxin New Energy Development Company Ltd.
Noise	<ul style="list-style-type: none"> <li>● In the control room of the machine and boiler and main control room, to install double layers noise insulation windows and doors, and the noise absorbing material should be adopted for the roof.</li> </ul>	Jiangsu Guoxin New Energy Development Company Ltd	Jiangsu Guoxin New Energy Development Company Ltd.

Environmental problem	Measures taken or to be taken	Implementing institution	Institution responsible
	<ul style="list-style-type: none"> <li>● Install noise insulation layer and heat preservation layer on the boiler and blower.</li> <li>● Install the muffle on the exhausting pipe of the boiler.</li> <li>● For every kind of rotational equipments that will produce noises, the limits should be set up, when they are ordered.</li> </ul>		
Accident risk	<ul style="list-style-type: none"> <li>● Establish a commanding team to deal with any accident, and take the charge of the implementation of the emergency activity plan</li> </ul>	Jiangsu Guoxin New Energy Development Company Ltd	Jiangsu Guoxin New Energy Development Company Ltd.
Environmental performance	<ul style="list-style-type: none"> <li>● Implement environmental monitoring</li> <li>● Improve the drainage defending facilities so as to reduce the possibilities of soil erosion</li> <li>● According to the plan, the monitoring of water, air and noise of the electricity plant are to be periodically carried out</li> </ul>	Jiangsu Guoxin New Energy Development Company Ltd	Jiangsu Guoxin New Energy Development Company Ltd.

### 7.3.2 The Plan of Environmental Protection Supervision

The environmental protection supervision aims at ensuring that the measures of decreasing disadvantageous influence would be taken into full account, improving the design, and ensuring the measures to be implemented appropriately and in time, and to minimize the negative influences and take it under efficient control. At the same time the plan is to ensure the project of straw generating-electricity to accord with related environmental protection procedure and standards.

The plan of the environmental supervision of the proposed project is shown in figure 7-3-2.

Table 7-3-2 the plan of environmental protection supervision

Period	Institution	Contents of supervision	Aims of supervision
Design and construction	Environmental Protection Bureau of Nantong; Environmental Protection Bureau of Rudong	<ul style="list-style-type: none"> <li>● Audit environmental impact assessment</li> <li>● Check the actualization of the environmental protection investment</li> <li>● Check whether the places where soil is dug or abandoned are</li> </ul>	<ul style="list-style-type: none"> <li>● Ensure the project to be compatible with the environment</li> <li>● Ensure the environmental performance of the project</li> <li>● Ensure to dependably</li> </ul>

Period	Institution	Contents of supervision	Aims of supervision
		reasonably chosen ● Censor the report of environmental monitoring ● Supervise the fulfillment of the environmental protection plan	carry out environmental protection measures
Operation	Environmental Protection Bureau of Nantong; Environmental Protection Bureau of Rudong	● Check up the monitoring report ● Check up the environmental protection measures lately put forward ● Supervise the environmental performance in the environmental sensitive spots ● Respond to environmental accident ● Harmonize the investigation and disposal about related environmental problems	● Ensure the implementing of environmental monitoring plan ● Ensure the unpredicted environmental problems to be discovered and solved in time ● Decrease the possibilities of accident and ensure to decrease the negative influence on environment at maximum degree after accident

### 7.3.3 The Environmental Monitoring Plan

#### 7.3.3.1 The Making of the Environmental Monitoring Plans

For the supervision of the implementation of each and every environmental protection measures, the plan of the environmental protection management is ready to be adjusted according to the monitoring results. The environmental monitoring station carries out the environmental monitoring. Jiangu Guoxin New Energy Development Company Ltd. is in charge of executing the plan of the environmental monitoring. The detailed information of the monitoring plan is shown in table 7-3-3.

Table 7-3-3 Plan of Environmental Monitoring; Responsible person: Zhang Dawei

Item	Monitoring site	Monitoring item	Monitoring frequency and time	Monitoring lasting time	Sampling time
Construction period					
Atmosphere (including dust) monitoring	Public Special Repair Station	PM <sub>10</sub>	One time/day	One day	One time respectively in the morning and in the afternoon during construction
	Waterworks	PM <sub>10</sub>	One time/day	One day	
	Tianshui village	PM <sub>10</sub>	One time/day	One day	

Item	Monitoring site	Monitoring item	Monitoring frequency and time	Monitoring lasting time	Sampling time
Noise monitoring	neighborhood	$L_{Aeq}$	At any moment or when there are complaints	One day	Twice a day during construction and 20 minutes for each time
Surface water monitoring	Jiuyao river under Yinquan bridge	SS, $COD_{Mn}$ , DO, TP, $NH_3-N$ , pH oil-like materials	Once a week	One day	One time respectively in the morning and in the afternoon
Operation period					
Atmosphere (including dust) monitoring	Public Special Repair Station	Dust, $PM_{10}$ , $SO_2$	At any moment that is possible	Two days	
	Waterworks	$PM_{10}$ , $SO_2$ , $NO_2$	At any moment that is possible	Two days	
	Tianshui village	$PM_{10}$ , $SO_2$	At any moment that is possible	Two days	
Surface water monitoring	Jiuyao river under Yinquan bridge	SS, $COD_{Mn}$ , DO, TP, $NH_3-N$ , pH	four times/year	Two days	One time respectively in the morning and in the afternoon
Noise monitoring	Neighborhood	$L_{Aeq}$	At any moment that is possible	Two days	One time respectively in daytime and at night

Table 7-3-4 List of Monitoring Method

Waste name	No.	Monitoring item	Monitoring method	Standard
Waste gas	1	Dust	Gravimetric method	GB5468-91
	2	Particle matter	Gravimetric method	GB16297-1996
	3	$SO_2$	Electrolysis with constant potential	HJ/T57-2000



Waste name	No.	Monitoring item	Monitoring method	Standard
	4	Blackness of flue gas	Ringleman smoke concentration determination	GB/T5468-91
Waste water	1	Water temperature	thermometer	GB13195-91
	2	pH value	Glass electrode method	GB6920-86
	3	COD	Sodium dichromate method	GB11914-89
	4	BOD <sub>5</sub>	Dilution and seeding method	GB7488-87
	5	Ammonia and nitrogen	Nessler's reagent colorimetric method	GB7479-87
	6	Suspension matter	Gravimetric method	GB11901-89
	7	Animal and plant oil	Infrared photometric method	JDS-106A
	8	Flow	Flow meter	GB7497-87
	9	Petroleum	Infrared photometric method	GB/T16488-1996
	10	Sulfides	Methylene blue spectrophotometry	GB/T16489-1996
Noise	1	Leq	Sound level meter	GB12349-90

Table 7-3-5 List of Monitoring Instruments

Name	Model	Polluants	Specification (measuring range)	Manufacturer
Fully automatic dust sampler	3012H	Dust	10-60L/min	Qingdao Laoshan Appliance Institute
Multi-components flue gas analyzer	Kine	SO <sub>2</sub> 、CO	SO <sub>2</sub> :0-5000ppm CO:0-10000 ppm	UK
pH meter	pH340/ION	pH	0-14	PE Company in Germany
BOD meter	BOD-220B	BOD	2-4000mg/l	Saipu Environment Protection Company
Flow meter	LS10	Flow	0.10-4.0m/s ±0.55%	Chongqing Hydrographic Environment Protection Institute
Spectrophotometer	721	Ammonia, nitrogen and sulfides	360-800nm	Shanghai NO. 3 Instrument Factory

Name	Model	Polluants	Specification (measuring range)	Manufacturer
Electronic balance	DT100	Suspension matter	0.1mg-100g ±0.05mg	Beijing Saiduolis Company
Infrared photometer for oil determination	JDS-106A	Petroleums, animal and plant oil	0-80 mg/l 0.3 mg/l	Jilin Beiguan Company
Multi-purpose noise meter	HS6288	Noise	--	Jiangsu Hongsheng Company

### 7.3.3.2 System of Monitoring Reports

During construction and operation, the environmental monitoring station of Rudong will compile the environmental monitoring reports. The reports of the construction period will be made four times a year and the report of the operation period will be made once a year. The reports are to be handed to the undertakers during the construction period and to the electricity plant leadership during operation period. The monitoring reports will also be handed to the Environmental Protection Bureau of Rudong County. The reports will include the monitoring results and the discussion about environmental quality. If there is the case that the monitoring results shows the construction is doing against the standards or unexpected negative influence has been resulted from, the alleviating measures should be worked out and carried out with the permission of government institution.

The electricity plant, as the owner, will be responsible for having monitoring reports and putting forward measures related. In special circumstances when the environmental monitoring unit identifies the remarkable and unexpected negative influence, the owner will check it up, and arrange to carry out the extra designed alleviating measures.

The construction period will last two years and the forecasting cost of monitoring amounts to RMB 150 thousand. During operation, the expenses of monitoring are about RMB 25 thousand a year, and the expenses reserved for emergency monitoring, RMB 100 thousand. After the proposed electricity plant is in operation, fulltime environmental protection personnel will have to be assigned, who are in charge of the daily management and maintenance of the facilities of green

maintenance, dust and noise decreasing and water disposing.

#### 7.4 Environmental Protection Personnel Training

To ensure the environment performance of the proposed project and all the above environmental measures to be carried out perfectly, the personnel concerned should be trained so as to be competent environmental protection people and to have full understanding and sufficient knowledge about the typical problems and alleviating measures during construction and operation.

The environmental management is a completely new thing for most management personnel and engineering technologists in other trades, especially for those in Rudong County and the management personnel of Jiangsu Guoxin New Energy Development Company Ltd. It is necessary to provide them with environmental protection training. It is very important to strengthen environmental management and environment protection training of the personnel in the management station and make them act properly and in time in dealing with the emergent accident.

The contents of training mainly include laws of environmental protection, codes, environment standards, environmental knowledge related to project construction, the environmental problems and environmental protection measures, especially those concerning the proposed project, the function of environmental supervision. The personnel trained have also to be familiar with the emergent plan of the proposed project and the operation procedure in emergency, and so on.

The training plan of the proposed project is shown in table 7-4-1

Table 7-4-1 Training plan and expenses of environmental protection person

Stage	Post	Training method	Person Number	Training duration	Time	Cost (RMB)
Construction period	Construction contractor	Site training provided by domestic qualified institution of environment protection	4	One week	The first half of 2006	4000

Stage	Post	Training method	Person Number	Training duration	Time	Cost (RMB)
	Supervision engineer for plant environment	Have the training program provided by domestic qualified institution of environment protection	2	Two weeks	The first half of 2006	4000
	Staff for Emergency measure	Site training provided by local experts of environment protection	2	Two weeks	The first half of 2006	4000
Operation period	Staff for environment supervision and management of the plant	Have the training program provided by domestic qualified institution of environment protection	2	One week	From the second half of 2006 to the plant operation	2000
	Analysis staff	Have the training program provided by domestic qualified institution of environment protection	2	Three weeks	From the second half of 2006 to the plant operation	6000
						20000
Note: the above trainings are carried out in China.						

### 7.5 Environmental Protection Investment

The estimated expenses of environmental protection of the proposed are shown in table 7-5-1.

Table 7-5-1 Table of the estimated expenses of environmental protection

Period	Item of environmental protection	Contents of measure	Number /location	expenses (ten-thousand Yuan)	Remark
Construction period	Environmental impact Assessment	Compile reports of environmental influence and plan of environmental activities	One set	15	
	Personnel training	Environmental supervision engineers	Eight persons	1.6	Training in domestic
	Environmental monitoring	Noise, water quality and environmental air	Three years	15	
	Obligated monitoring expenses for emergent accidents			4	
	Environmental supervision		Two persons	4	Two years of construction period
	Prevention and cure of environmental air pollution	Water spraying truck	One	25	
	Maintenance of water and soil	Defending walls and other defending measures	Whole plant	2	Analogy analysis calculation
	Prevention and cure of water pollution	Temporary manure pit in construction encampment	Two	0.5	
	Restore of places in which soil dug or abandoned	Greened side pitches, precipitating pool, blocking soil wall	Within plant	10	Analogy
	Measures of noise's prevention	Set up insulating noise windows		1.0	
Operation period	Emergency measures	The routine training every year	Two persons	0.5	Counting on 0.5thousand RMB/person
	Prevention of water pollution	Disposal station of noise pollution		10	Analogy

Period	Item of environmental protection	Contents of measure	Number /location	expenses (ten-thousand Yuan)	Remark
	Prevention of noise	Indication card for limiting speed and forbidding ring	About ten blocks in total	1.0	
	Environmental monitoring	Environmental air, noise and earth surface's water		25	Counting on 25 thousand RMB/year
	Obligated expenses for emergency			10	
Small account of expenses				124.6	
Not forecast expenses (10%)				12.5	
Total expenses				137.1	

The above table shows that the total implementing expenses (including the setting expenses for occupying land and removing houses of the project) of environmental management, supervision and measures of the project is 1.371 million Yuan (environmental protection facilities is RMB 25.051 million). The total investment is RMB 291.8278 million and the environmental protection investment counts for 8.58% of the total investment of the project.