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GOC/GEF/The World Bank

China Renewable Energy Scale-up Program

100MW HUITENGXILE WIND POWER PROJECT IN INNERMOGOLIA

Environment Impact Assessment

THE INSTITUTE OF POWER

EXPLORATING AND DESIGNING, INNER MOGOLIA

Date: 28th January, 2005 Place: HUHHOT

Contents

1 Summary of the Project

1.1 Geographic location

Huitengxile wind farm is located in Huitengxile grassland, which is in the north border of Baiyinchanghan town and Hardatusumu, Zhuozishan county and in the south of Desheng town, chayouzhongqi, Wulanchabu city of Inner Mongolia Autonomous Region, People's Republic of China. The height above sea level of the wind farm varies from 2,000m to 2,131m and its central coordination is between the north latitude of 41°05' and the east longitude of 112°41' . The wind farm is 120km west to Huhhot, the capital city of Inner Mongolia Autonomous Region and 60km east to Jining, where the municipal government of Wulanchabu city is located.

Huitengxile wind farm is in Huitengliang area, which is in the east part of Daqingshan Mountains. It belongs to continental monsoon climate. The main weather affection of this area is the cyclone from the bend of the Yellow River and the cold high pressure from Siberia and Mongolia Plateau. Affected by the strong cold pressure, this area becomes the main path when the cold air flows down from north to south. The natural characteristics of this area such as the high altitude, open terrain, low vegetation, fewer buildings, and the affection when air flows through the raised tableland from north to south, etc., make it possible that the wind energy resource is very rich here, it is one of the richest wind energy resource areas in China.

1.2 Brief introduction of the project

Huitengxile wind farm with total planned capacity of 200MW was primarily built in 1996. By the end of 2003, the total installed capacity in this wind farm is 42.7 MW, among which 5.4MW(9 sets with 600kW each) wind turbines are financially supported by Danish government; 19.8MW(33 sets with 600kW each) wind turbines are under the project of "double Promotion" sponsored by Chinese government; 5.4MW(9 sets with 600kW each) wind turbines are under the financial assistant by Dutch government, 5.5MW(10 sets with 550 kW each) wind turbines are supported by the US import & export Bank loan, 5.4MW(9 sets with 600kW each) wind turbines are supported by Germany government; and 2 test sets with 600kW each erected by Micon A/S

and Beijing Wandian Company. At present, there is one substation (110kV, Caoduoshan substation) in the wind farm, with the capacity of 76MVA(1×16+1×20+1×40), and the voltage is 110/35/10kV. The generation of the wind turbines feed in the west main electricity network of Inner Mongolia by the 110kV transmission line to the 110kV bus of Gaoshun 220kV Substation.

This project is a technical reformation project as well as the commercialization promotion project of China renewable energy program supported by GEF and the World Bank. The scale of this phase is 100MW (with the wind turbines of 750kW-1500kW each). Referring to the existing experiences of designing and building, the row space is 7 D and the column is 5 D, meanwhile, an auxiliary transmission line to Desheng 220kV substation and one 110kV substation (2×630MVA) will be built.

1.3 Features of the region

1.3.1 The terrain

Huitengxile wind farm region is tableland grassland with an area of about 300km^2. The occupied area of Huitengxile wind farm is about 100km^2. The terrain of the wind farm is flat with few buildings and low vegetation, and it has more than ten lakes with different sizes. The altitude varies from 2,000m to 2,130m.

Most part of the wind farm is meadow, grazing or open land with few trees. The geological structure of the wind farm belongs to intermountain lava tableland with no structure affection, it has fine stability and no rift passes through.

Location of this project is in the southeast of the existing wind farm, which is along with the ke-zhuo road at the site of 18.5km-21.5km. The total size of this phase will be 22km^2 of flat and open land with no buildings.

Huitengliang area is typical mountainous grassland. The soil is chernozem; the vegetation are mainly gamineous grass with little linear-leaf chrysanthemum, garden burnet, artemisia, wind-weed and Chinese thorowax etc.; the birds are mainly rock partridge, quail, partridge with spotted wings, turtledove, lark and tree sparrow.

1.3.2 Wind energy resources

Huitengxile region belongs to temperate zone continental monsoon climate; the main affecting systems of climate in this area are cyclone from the bend of the Yellow River and the cold high pressure from Siberia and Mongolia Plateau. The cyclone from the bend of the Yellow River mainly affects the precipitation of the middle and west Inner Mongolia, the precipitation in this region generally concentrates in summer, little rain and large variability are the main features. The most serious influence to the area is the high cold pressure from Mongolia plateau, especially in December and January. It has long cold winter and short cool summer, and the wind speed is high in winter and spring, the mean annual wind speed at the height of 10 meters is 7.2m/s, about 70~80 days the instantaneous wind speed is more than 17m/s.

Controlled by the strong Mongolia cold high pressure, Huitengxile area has become the main path for the cold air. The altitude of the site is relatively high, so it has increasing effect as the air stream passes through this area from north down to the south. Furthermore, the area is open and flat with low vegetation and few buildings and trees and small frictional resistance, it is windy all the year round, especially higher in winter and spring, so the wind energy resource is very rich.

(1) Measurement method

In order to develop and utilize wind energy resource, the former Inner Mongolia Electricity Company had erected 10 measuring towers (40m high) in the middle area of 100km^2 in December 1993 and had performed measurement from March 1994 to February 1995. After that, the work was suspended due to some reasons. In October 1997, Inner Mongolia Longyuan Wind Energy Developing Cooperation restarted the measuring work in Huitengxile wind farm. 4 measurement towers (40m high) were erected and 8 sets of EL anemometers were installed. In addition, a basic meteorological station was built. Since then, the measuring work has been performed continuously for 6 years.

Based on the analysis of wind data collected from anemometers, the average wind speed at the height of 40m is 8.4 m/s in the past 6 years, and the average wind power density is 500W/m^2. The yearly average wind speed is steady and the variation range is 8.0~8.9m/s, but the average wind speed in

every month of one year varies, the wind speed in January, February and March is relatively high, and the variation range is 9.9~11.3m/s; the wind speed during June to September is relatively low and the variation range is 5.9~6.6m/s.

(2) Distribution of wind speed and wind energy

The 40m high distribution statistics of wind speed and wind energy frequency of the wind farm show that the wind speed multi-values appear at the range of 4~10m/s, accounting for about 71% of annual wind speed distribution; the wind energy multi-values appear at the range of 10~16m/s , accounting for 69% of total wind energy distribution.

The 10m high distribution statistics of wind speed and wind energy frequency show that the wind speed multi-values appear at the range of 4~8m/s, accounting for about 71% of the annual wind speed; the wind energy frequency multi-values appear at the range of 8~12m/s, accounting for 64% of total wind energy distribution.

(3) Wind energy direction

From the statistics and analysis of the wind energy frequency data measured by the 40m high anemometers during 1998~2003 , the wind energy is mainly concentrated at 225~335°. According to the statistics of a typical year (2001), the wind energy concentrated at 225~335°accounts for 70% of the total wind energy.

The statistics and analysis of wind direction and wind energy frequency at the height of 10m in 2001 show that the wind energy is mainly concentrated at 225°□335°, accounting for 72% of the total wind energy and it is almost identical with the wind energy frequency distribution at 40m high.

From the above analysis we can see that the wind direction of the area is stable and the wind energy is concentrative.

1.3.3 Transportation

Huitengxile wind-farm is 120km east to Huhhot, the capital city of Inner Mongolia Autonomous Region, 60km west to Jining, and 36km south to Zhuozishan railway station. The Ke -Zhuo road goes through the middle part of the wind farm and connects to the110 national highway in the south. So the large wind turbines can be directly transported to the wind farm.

The ground of the wind farm is flat, and the existing natural road can be used for transportation during the installation period and the maintenance work after the wind turbines put into operation. Equipments can be directly transported to their locations without second transportation or manual carrying.

1.4 Social and economic situation

1.4.1 Social and economic situation of Inner Mongolia Autonomous Region

Inner Mongolia Autonomous Region is located in the north border of the People's Republic of China. It is long and narrow from the northeast to southwest. The terrain is mainly plateau so it is normally called Inner Mongolia plateau. The area of the region is 1.18 million km^2 with the population of about 20 million, as it is an autonomous region with multi-nationalities, Mongolia nationality is the main part.

Inner Mongolia has a vast territory and rich resources, and it is commonly known as "Forest in the east and iron in the west, agriculture in the south and animal husbandry in the north, coal are everywhere". The total grassland in the region reaches 0.88 million km^2 and it is an important animal husbandry base in China. Hetao and Tumochuan plains are famous grain producing bases in China. The industry enterprises in Inner Mongolia are mainly engaged in iron steel, coal, electric power, metallurgy, textile, chemistry, leather and brewery etc. By the end of 2002, the GDP of the region reached 173.248 billion yuan RMB, compared with the last year, 12.1% was increased; the grain production reached 1.41million tons and 13.5% was increased compared with the last year; the raw coal production reached 114.9763 million tons and 40% was increased compared with the last year; the electricity power generation reached 54.726 billion kWh and 17.6% was increased compared with the last year.

1.4.2 Social and economic situation of Wulanchabu city

Wulanchabu city is located in the middle of Inner Mongolia Autonomous Region with an area of 84000km^2. The total population is 3.16 million, including more than 20 nationalities.

Wulanchabu city belongs to northern dry land crops area, the total cultivated area is 13400 km^2. Crops here are mainly wheat, naked oats and

potato. The grass resources for animal husbandry in the area are relatively rich. It is a famous natural pastureland in Inner Mongolia and the total area of the grassland is 58000 km^2. It is also an important meat production base in Inner Mongolia.

Industrial enterprises in Wulanchabu city have expended to a certain scale. Enterprises of electricity, metallurgy, machinery, coal, construction materials, fertilizer, fresh processing, sugaring and brewing have already been founded, and mineral resources are also rich, more than 70 minerals have been discovered and 25 minerals have been utilized by now.

Referring to the transportation, the railway from Beijing to Baotou city goes through the middle part of the area; the Ji-Er railroad is start from Jining, the location of the administrative offices of Wulanchabu city, to Erlianhot, an important land port city in north China and connects to the railway of Republic of Mongolia; in addition, Ji-Tong railroad is associated with five more railroads in Tongliao. The road network has been formed, which is centered in Jining, and the 110 national road is the main vehicular truck line, reaching various counties and towns attached to Wulanchabu city and the adjoin areas.

1.4.3 Social and economic situation of Huitengxile wind farm area

The wind farm is located in the middle of Chayouzhongqi, with an area of 300 km^2. Chayouzhongqi belongs to half agriculture and half animal husbandry area. The main corps is wheat and potatoes, and the total corps production in 2000 was about 154 million kg. Animal husbandry is mainly sheep, horses and cattle. The total amount of livestock on hand in 2000 was 708 thousand. The average income in this area in 2000 was 3,385 yuan and 1,828 yuan was the net income of farmers and herdsmen.

1.5 Land used

The 100 MW technical reformation phase in Huitengxile wind farm will be carried out on the grassland of Huitengliang farm, neither the land of other villages nor the farmland will be occupied.

Huitengliang farm was founded in 1953. It is a state-owned stud and the land is also state-owned. Its function is mainly keeping stud horses and breeding and developing Inner Mongolia fine-wool sheep. The total area of the farm is 4800hm^2, and the area of grassland is 4300hm^2, among which the high

quality meadow is more than 670hm^2, the forage grass land is 170hm^2, the area of covered pen is 6,615 m^2, the area of living quarters for staff and workers is 3,554 m^2 and the area of other infrastructure is 3,911 m^2. There are 332 employees in the farm, including 120 workers, 5 administrative management personnel, 6 studhorse feeding and managing stuffs, 6 technical staffs, 74 fine-wool sheep feeding and managing stuffs, 30 teachers and service stuffs and 16 retired persons. The current management mode is that the farm contract studhorses, fine-wool sheep and fodder land to staffs, but excluding the meadow, the meadow is used by all. There are also infrastructures in the farm such as administrative office, livestock veterinary station, guesthouse, canteen, living quarters, covered pen, ammonia ion stove and grass storage yard. Based on the animal husbandry production, the annual total income is about 0.6 million yuan and the average income per capita is more than 3,000 yuan.

Currently, the meadow area in Huitengliang farm is about 4300hm^2, the permanent occupied land of this project is about 23.65hm^2 , accounting for 0.55% of the meadow area. Very small impact on animal husbandry production will be produced. At the construction time, some temporary land will be occupied for one or two years, plus the recovering time, 3 years will be enough, and the land will be returned to Huitengliang farm after construction. Moreover, during construction period, the region and meadow will be occupied as planned strictly, so it will have few impacts on the production and living conditions of local villagers.

2 Summary of Environmental Impact

2.1 Ecology status

The Huitengxile wind farm is located on Huitengliang ridge in the middle part of Wulanchabu city, Inner Mongolia. This area is typical mountainous meadow grassland, the soil is chernozem, the vegetation is mainly graminence pasture with less chrysonthemum, artemisia, rhizoma anemarrheae and radix bupleuri etc. and there are some kinds of bird like rock partridge, quail, partridge, turtledove, lark and tree sparrow etc.

2.1.1 Potential impact on birds during construction period

Construction period mainly refers to the time of foundations construction, wind turbines installation, meteorological observation tower setting up, roads repairing inside the wind-farm and other facilities. The typical potential impacts that will disturb the original living environment of birds should be the noise, dust and transportation vehicles etc., and the birds inside the wind-farm will not be able to seek food, build their nest and breed here. Since the construction period is short, comparing with the whole area, the occupied land is small. In addition, the birds have the ability to avoid danger and they can migrate to other places where the conditions is the same, therefore, the construction will neither produce serious impact nor cause the reduction of birds.

2.1.2 Potential impact on migratory birds

According to the collected bird ring-mark information, Huitengxile wind-farm area is neither the main habitat for migrant nor the main path passed by migrant birds, so the construction of the wind-farm has almost no impact on migrant birds. From available information, the flying height of most birds is around 300 meters, but the hub height of the chosen wind turbine in this phase will be no more than 100 meters. The average flying height for migrant birds is much higher than 100 meters, so it is impossible for migratory birds to collide wind turbine when they fly through this area. For this reason, there is no impact on migratory birds after the wind turbines put into operation.

2.1.3 Potential impact on Birds' colliding with wind turbines

Flying birds within the wind farm may collide with the blades of wind turbines, electric transmission line and meteorological measuring towers. Some big size or heavy birds, water birds, some birds of prey catching other birds and the birds flying in low level in night are apt to collide with wind turbines. The birds' data of Huitengliang area show that most birds mentioned above are not seen often, so the chance for birds colliding with wind turbines is few, which means that the wind turbines will have little impact on these birds. Other common birds are small in size and fly agilely. In addition, wind turbines are so obvious that the birds can see it clearly and avoid it. It has little chance for these birds to collide with the wind turbines. Therefore, the construction of the wind farm will have little impact on birds in the area. So far there haven't been

any studies on the impact of the existing wind farm on the birds. According to a ten-year investigation on this wind farm, there hasn't been any crash accidents occurred.

2.2 Impact on natural landscape

In this project, some wind turbines (from 750kW to1500 kW each) will be erected in the southeast side of the existing wind-farm. The local residents believe that so many wind turbines standing upright on the grassland will not destroy the local natural landscape. However, it will form beautiful and attractive scenery. In the vast grassland, a lot of white wind turbines stand in order and rotate in the blue sky, the white cloud and green grassland. In fact, since the primary construction was completed, the tourism site had been built by the relevant department. The local tourism resource is developed and considerable tourism revenue is gained. As the expanding of the wind farm, the number of wind turbines will grow and the scenery will be surely more beautiful. For this reason, this phase of Huitengxile wind farm will have no impact on the local scenery; on the contrary, it will raise the local scenery value and increase tourism revenue.

2.3 Potential impact on electromagnetic radiation

2.3.1 Impact on electromagnetic radiation to the health of local residents

A special study shows that when electromagnetic radiation with or beyond the intensity of 4kv/m acts on a healthy people for a long time, he will be damaged. Electromagnetic radiation with certain energy will be produced during operation of the wind farm, but its intensity is relatively low. Although there hasn't been a practical value for relatively low intensity electromagnetic radiation, it is can be deduced from the available test data of 220kv. The maximum intensity of 110kv/m is 0.287kv/m, which occupies 7.2 percent of the standard intensity 4kv/m. In addition, the wind farm is far from residential area, so it is believed that the electromagnetic radiation produced by Huitengxile wind farm will not create hazard to the health of residents nearby.

2.3.2 Disturbance of electromagnetic radiation to radio and television

We learnt from the investigation of residents who live near the wind farm that the wind farm operation currently has no influence on local radio and television etc; therefore, it is believed that this phase will not produce disturbance to local radio and television.

2.4 Impact on Noise

2.4.1 Noise impact on the surrounding environment

Since the specialty that the wind farm must be built in the place with rich wind energy resource and wind turbines must operate in some higher wind speed, the noise of the site is relatively large. When wind speed is high, the natural noise covers up the noise of wind turbines, and the noise impact produced by wind turbines on the surrounding environment is far less than the noise produced by natural wind; when wind speed is relatively low, noise produced by the wind turbines will attenuate rapidly. According to practical measuring results in Zhangbei wind farm, the environment noise in the place of 250m far from wind turbines is 39.5 dB (A) which is lower than the limit of class one urban environment noise standard (55 dB (A) in daytime and 45 dB (A) in the night). Therefore, the operation of wind turbines almost cannot produce noise impact on surrounding environment. This may be true for one unit, or maybe for all of the units currently in place. However, the proposed phase will have 750kW to 1500kW wind turbines which are larger than the existing wind turbines (72 sets and the largest is 600kW). So it is not immediately obvious that noise will not be a problem. Since the 1500kW wind turbines haven’t been put into operation, it is not available to predict and analogize the results.

2.4.2 Noise impact on the staff

According to the data provided by wind turbines manufacturers, the largest noise level is about 90 dB (A). Since the operation work in the wind farm is totally finished by computers, normally the operation staffs will work in the control room. It is no need for them to work near the wind turbines. In addition, the control room is quite far from wind turbines, the noise of wind turbines cannot affect the health of operators. As for those who must do repairing and maintenance job, normally the wind turbines must be shut down,

and the working period is short, so it is believed that the noise of wind farm have no impact on the health of operation staffs.

2.5 Reasonable arrangement of the transmission line

Huitengxile wind farm is far from residential area and the power transmission lines are not in residential area either, they go through the desolate and uninhabited tableland. The existing substation (110kV, Caoduoshan substation) with the capacity of 76MVA(1×16+1×20+1×40) is 110/35/10kV. A 15km 110kV transmission line to the 110kV bus of 220kV Gaoshun Substation will be erected so that the power generation of the wind turbines will feed in the west main electricity network of Inner Mongolia. It will go 1.5km over to the west of the existing 110kV line from the wind farm, and then parallel to the existing Gaoshun-Desheng 220kV line to the Desheng substation in the north (see the drawing for detail). The distance between the two lines will be 30m. The rated voltage grade of the new line will be 110kV, the type of the cable will take LGJ-400/35. There will erect 49 towers for the line, the foundations of the line towers will occupy 250m^2,which is neither cultivated land nor residential area, and the height of the towers will be 27-30m. The arrangement of the power transmission lines is reasonable and in accordance with the design, it will have no impact on the producing and living condition of the residents.

The design of power transmission line follows the design criterion for substation, the distance to the ground will meet the design specifications, so it will be safe as pedestrian or sheep pass by under the transmission lines.

2.6 Impact during construction period

(1) In order to protect meadow, the soil from foundation will be moved away manually; stones will be loosened by explosion first and then moved away manually, the residents nearby will be announced two days before the explosion.

(2) At wind turbines assembling site, all the facilities will be put in place as designed so as to control the occupied area and protect the meadow effectively.

(3) It has been issued that all vehicles must run on the specified roads and mustn’t run in grassland randomly in order to protect meadow during the construction period.

(4) 50% of spoil produced during construction will be backfilled into the foundations and the other 50% will be backfilled into adjacent gully.

(5) After the construction, both sides of the road especially for repairing and maintenance in the wind farm will be made green in order to reduce the desertification of the area.

Detailed regulations during the construction and operation see table 5.1-1

3 Other Condition

Two villages, Hongpan and Caoduoshan, are near Huitengxile wind farm. Hongpan is located 3km north to the wind form. There live 261 people in the village and they are all Han nationality. The village occupies 80km^2 in which 13km^2 are farmland and crops are mainly barley and oil crops. Caoduoshan is located 2.5km northwest to the wind farm. There live 182 people in the village and they are all Han nationality. The village occupies 52km^2 in which 9.3km^2 are farmland and crops are mainly barley and oil crops.

4 Benefit Analysis

4.1 Social and environmental benefit

A 100MW coal-fired power plant runs 2,440 hours per year will produce 826 tons of smoke, 1,900 tons of SO_2 and 11000 tons of rejects. It also needs a large quantity of water, and about 60~80 dB (A) noise will be produced due to factors like exhaustion, mechanical rotating friction and electromagnetic. The power generation process of wind turbines is to transform the local wind energy into mechanical energy, then to electricity energy. This will not produce pollution of air, liquid, solid contaminants or produce serious sound pollution during the whole process.

The wind farm will be one of the best replacements of coal-fired power plant, for it utilizes natural renewable resources, and it will greatly reduce pollution to the surrounding environment, save normal fossil energy, protect ecological environment.

4.2 Coal saving and electric power increasing

A 100MW coal-fired power plant consumes 115 thousand tons of standard coal. This big number can be saved by utilizing wind energy resource, meanwhile 405,408MWh green power generation will be increased in the power network and good economic returns will be gained.

5 Environment Management plan

5.1 Environment relief plan

The possible impacts on the environment and the environment relief methods are listed in the following schedule. See Table 5.1.

Table 5.1 Environment relief plan of the construction project

Stage	Content	Relief methods	controllers
Construction	• Permanent negative impact on the road during construction period and wind turbines maintenance period	1. Occupied road during construction must meet the design requirement. (This report is provided only for the stage of accessible research. The specific information about design requirements will be issued on the construction drawing in next stage.) 2. Vehicles run on the certain road during maintenance, other land will not be occupied. This requirement will be enforced according to certain related rules and some road landmarks.	Construction team and wind farm
	• Construction noise	1. Equipments with high noise (85 dB (A)) will only be used in the area of construction. 2. The operation time of equipments with high noise will be from 6:00 a.m. to 20.00 pm.	Construction team

	• Foundations	Rocks for the foundation excavation of wind turbines are loosened by explosion; they will be moved away from grassland. Rocks can be used for road reparation.	Constructio n team
	• Wind-turbines installation area	1. Delimit installation area. 2. All the equipments must be put in places as designed to control the occupied area effectively.	Constructio n team
	• Traffic transportation	1. It has been issued in a specified program plan that vehicles must run on specified road; do not run randomly in order to protect grassland better. This will be enforced by some related rules, like setting blocks, landmarks and supervision, etc. 2. The road will be repaired after construction and to be used as maintenance road.	Constructio n team Wind farm
	• Spoil produced during construction	1. Local ESP has approved that 50% of spoil will be backfilled into foundations and 50% will fill in the near gully. 2. The backfilled part will be made green in order to avoid the possible soil erosion.	Constructio n team Wind farm
Operation	• Road for maintenance	Make plan to use the existing road as far as possible and reduce meadow occupation at maximum limit.	wind farm
	• Noise made by the wind turbines	1. Select equipments with low noise. Specify an approximate value (in dB[A]) for “low noise”. (The approximate value of noise is not higher than 100dB(A)) 2. Operation staffs will work in the control room. 3. Wind turbines will be designed to install in the place as far as possible from residential area.	Design institute, Constructio n team Wind-farm
	• Power transmission line	1. Arrange outside the residential area. 2. Distance to the ground should meet the requirement of design criteria. According to the “110kv-220kv power transmit wire design specification” DL/P5092 issued in 1999, the design criterion is more than 6m.	Design institute, Constructio n team

Note: The items marked in “·”will be clarified as the responsibility of contractors in tender document.

5.2 Monitoring plan

The monitoring plan of environment management, see Table 5.2-1, and the purchasing of monitoring equipments, see Table 5.2-2.

Table 5.2-1 Monitoring plan of environment management

Stage	Monitoring comments	Monitoring place	Category of monitoring equipments	Monitoring frequency or duration	controllers
Construction phase	noise	Two villages near the construction site	Integrating precision sound-level meter of type two or above will be used for measuring. (See Table 5-3, below)	Monitor 3 times during construction period, one day long of continuously testing for each, and statistics of day and night will be obtained separately.	Wulanchabu Environment Research Institute
Operation phase	Operation noise	Three villages near the wind turbines	Integrating precision sound-level meter of type two or above will be used for measuring. (See Table 5-3, below)	Monitor twice a year, one day long of continuously testing for each, and statistics of day and night will be obtained separately.	Wind farm Wulanchabu Environment Research Institute

	Power-frequency electric field intensity and magnetic field intensity	1. Select three places at 30m, 50m and 100 m far from transmission line 2. Set one point every 5m at the high voltage feed-in side, at the range of 0~500m outside the wall of the substation.	Use power-frequency electric field meter (See Table 5.3, below) to measure power-frequency electric field intensity (normal component) and magnetic field intensity (normal and horizontal component) on 0~1.5 m above ground.	Twice for the first two years, three times each day, and one hour each time, if there no change, then once every 3 or five years.	
	Radio interference field strength	Set monitoring points on 2^0m, 2^1m, 2^2m…… 2^{11}m at high voltage feed-in side outside the wall of substation, monitoring frequency is 0.5MH$_Z$.	Measure by radio interference field intensify meter	Twice for the first two years, three times each day, and one hour each time, if there no change, then once every 3 or five years.	

Table 5.2-2 Purchase of monitoring equipments

Equipments selection	Number	Unit price (10,000 yuan)	Total value (10,000 yuan)	manufacturer
PMM8053A electromagnetic radiation measuring instrument	2	18.3	37.6	PMM company, Italy
ZN3950 type radio interference field strength	2	4.7	9.4	Beijing No.2 Radio Instrument

meter				Instrument Factory
HS5670 type precision integrating sound meter	2	1.1	2.2	Hongsheng State Equipment Factory, Jiangxi province

5.3 Schedule

Table 5.3-1 Schedule of relief activities

Stage	Time for relief	Measure	Unit in charge
Construction	From beginning to the end	Monitoring and inspection	Construction team, wind farm
Operation	Twice a year after putting into operation	Monitoring	Wind-farm, Wulanchabu Environment Research Institute

Table 5.3-2 Schedule of monitoring activity

Stage	Time for monitoring	Unit in charge
Operation	Once in March and once in October every year	Wind -farm, Wulanchabu Environment Research Institute

5.4 Organization

Discussed by Inner Mongolia North longyuan Wind Energy Cooperation and Wulanchabu Environmental Protection Bureau, an agreement had been made that Wulanchabu Environment Research Institute will take the responsibility for the environment management plan.

5.4.1 Monitoring and reporting

Based on the State Environment Effect Evaluation Law, Wulanchabu Environment Research Institute will take the responsibility to evaluate the environment impact within the construction and operation period, provide measurements to prevent or reduce the negative impacts on the environment, and make tracing monitoring.

5.4.2 Procedure of environment management instruction

The director and the vice director of Wulanchabu Environment Research Institute, Mr. Zhao Lijun and Mr. He Tao will be responsible for collecting

data, making analysis and compiling report, and the report will be sent to Mr. Zhang Xianliang, the chief of Environment and Management Section, Wulanchabu Environment Protection Bureau. Signed by the director of Wulanchabu Environment Protection Bureau, Mr. Tang Zhongyi, the section will start the implement.

The interval of sending will be 7~15 days. If the receiver has different opinion, he can apply reconsideration to the above environment management department.

5.5 Public consultation and investigation

To gain good economic, social and environmental results, it is necessary to know issues such as the impacts on noise, land occupation and electromagnetic to environment etc., which are commonly concerned by the residents around the wind farm area, in order to supply effective solutions in the design of the project. To attain this aim, we have drafted investigation and send the draft to the residents near the wind farm, 7 days later, we collected the investigation draft. The results are as the following: (see table 5.5-1)

Table 5.5-1 public consultation

<table>
<tr><td colspan="6">Public consultation is an important part in environmental impact evaluation of a project. To gain good economic, social and environment results, it is necessary for us to know problems commonly concerned by you, such as the impact on noise and land occupation, the interference on your TV etc., in order to supply effective solutions in the design of the project. To achieve the aim, a special draft will be filled by you. We sincerely hope you can support us to complete the investigation. The brief summary of the project is as follows: This is an expanded project of Huitengxile wind-farm which will be carried out by Inner Mongolia North longyuan Wind Power Cooperation. It will be financially supported by GEF and the World Bank. The installed capacity will be 100MW, with wind turbines of 750kW to 1500 kW and they will be installed in the south of the existing wind farm.</td></tr>
<tr><td>Name</td><td></td><td>Gender</td><td></td><td>Age</td><td></td></tr>
<tr><td>Address</td><td colspan="2"></td><td>Working unit</td><td colspan="2"></td></tr>
<tr><td>Educational level (□)</td><td colspan="5">Junior middle school□ senior high school□ Technical school□ College□ Master degree□ Others □</td></tr>
<tr><td>Occupation (□)</td><td colspan="5">Farmer□ Worker□ Cadre□ Student □ Teacher□ Other□</td></tr>
<tr><td colspan="3">1. Is the environment of your living, working or studying quiet?</td><td>quiet□</td><td>Not quiet □</td><td>Uncertain □</td></tr>
<tr><td colspan="3">2. Any radio electromagnetic interference when you watch TV at home?</td><td>Yes □</td><td>No□</td><td>Have no idea□</td></tr>
<tr><td colspan="3">3.Do you think that the project will bring any negative impact to your family?(if there is, describe in detail in attached papers)</td><td>Yes□</td><td>No □</td><td>Have no idea □</td></tr>
<tr><td colspan="3">4. Will the project be benefit to your working and living conditions?</td><td>Yes □</td><td>No □</td><td>Not clear □</td></tr>
</table>

5. Do you think there is any effect on sound quality?	Beneficial □	Not beneficial □	Not clear □
6. What environment problem do you mostly concern about during construction and operation of the project?	Electromagnetic interference □	Noise effect □	Waste water discharge □
7. Do you agree on the construction of the project?	Agree □	Not agree □	Indifference □
8. What problems should be concerned when select environment protection measures?			
9. Any other opinions and suggestions from you on the construction of the project?			

Consulting time□ Day month year Signature:

Fifty drafts were sent for the investigation, and 38 effective forms were collected. Condition of the investigated people can be seen in Table 5.5-2, and the statistics result of issues, see Table 5.5-3.

The statistics from the results show as the following:

(1) Current living, working and studying environment is quiet so all of the investigated people are satisfied.

(2) 82% of the investigated people think that there is no radio electromagnetic radiation interference when they are watching TV at home, 8% of them think that the effect exists and 3% people are not clear.

(3) 79% of the investigated people think that no bad effect to their family life from the project, 18% of them think that effect exists and 3% of people are not clear.

(4) 82% of the investigated people think that the project is beneficial for improving their working and living conditions, 3% of them think no improvement and another 3% of them are not clear.

(5) 39% of the investigated people think that the construction of the project has no sound quality effect, 8% of them think that effect exists and 53% of then are not clear.

(6) 18% of the investigated people are mostly concerned about electromagnetic interference, while 82% of them are mostly concerned about noise impact.

(7) 100% of the investigated people agree on the construction, and no investigated people against the project.

Table 5.5-2 basic condition of the investigated people

Series No.	Name	Gender	Age	Education level	Occupation	Residential area	Re-mark

1	Zhang Er'gen	Male	43	Junior middle school	farmer	Hongpan village , Desheng town	
2	Lu Ping	Male	31	Junior middle school	farmer	As above	
3	Li Sidan	Male	45	High school	farmer	As above	
4	Zhao Genwa	Male	51		farmer	As above	
5	Shang Yonggang	Male	34	Junior	farmer	As above	
6	Shang Sanwa	Male	55	Junior	farmer	As above	
7	Li Fuwang	Male	54		farmer	As above	
8	Feng Genming	Male	44	High school	farmer	As above	
9	Li Jianmin	Male	32	High school	farmer	As above	
10	Li Guokou	Male	40	Junior	farmer	As above	
11	Liu Yao	Male	38	Junior	farmer	As above	
12	Zhao Lama	Male	45	Junior	farmer	As above	
13	Guo Yongba	Male	36	Junior	farmer	As above	
14	Cao Zhicheng	Male	35	Junior	farmer	As above	
15	Li Yanzhu	Male	41	Junior	farmer	As above	
16	Cao Zhancheng	Male	37	Junior	farmer	As above	
17	Guo Rike	Male	46	Junior	farmer	As above	
18	Liu Wangwang	Male	38	Junior	farmer	As above	
19	Zhao Zhuzhu	Male	45	Junior	farmer	As above	
20	Liu er'mao	Male	34	Junior	farmer	As above	
21	Zhang Quanfu	Male		Junior	farmer	Caoduoshan village, Desheng town	
22	Niu Meikui	Male		Junior	farmer	As above	
23	Zhu Fenkui	Male		Junior	farmer	As above	
24	Xi Genge	Male		Junior	farmer	As above	
25	Li Jiayin	Male		Junior	farmer	As above	
26	Dong Liujin	Male	62		farmer	As above	
27	Jia Sanwa	Male	68		farmer	As above	

28	Su Tianfu	Male	40	Junior	farmer	As above	
29	Jia Jinzhu	Male	39	Junior	farmer	As above	
30	Li Dawen	Male		High school	farmer	As above	
31	Li Kuitang	Male	60	Junior	farmer	As above	
32	Li Tiantang	Male	50	Junior	farmer	As above	
33	Pan Runsheng	Male	41	Junior	farmer	As above	
34	Dong Kuizhu	Male	40	Junior	farmer	As above	
35	Xin Genkou	Male	50	Junior	farmer	As above	
36	Li Youtang	Male	46	Junior	farmer	As above	
37	Su Guofu	Male	32	Junior	farmer	As above	
38	Jia Kuizhu	Male	36	Junior	farmer	As above	

Consulting time: April 26, 2004

Table 5.5-3 Statistics of Investigation results

Content		Number of people	%
1. Is the environment your living, working and studying quiet?	Quiet	38	100
	Not quiet	0	0
	Not certain	0	0
2. Any radio electromagnetic interference when you watch TV at home?	Yes	3	8
	No	34	89
	Not to know	1	3
3. Do you think that the project will bring any negative impact to your family? (if there is, describe in detail in attached papers)	Yes	7	18
	No	30	79
	Not to know	1	3
4. Will the project be benefit to your working and living conditions?	Yes	31	82
	No	1	3
	Not clear	6	16
5. Do you think there is any effect on sound quality?	Benefit	15	39
	Not benefit	3	8
	Not Clear	20	53
6. What environment problem do you mostly concern about during construction and operation of the project?	Electromagnetic interference	7	18
	Noise	31	82
	Waste water discharge	0	0
	Agree	38	100

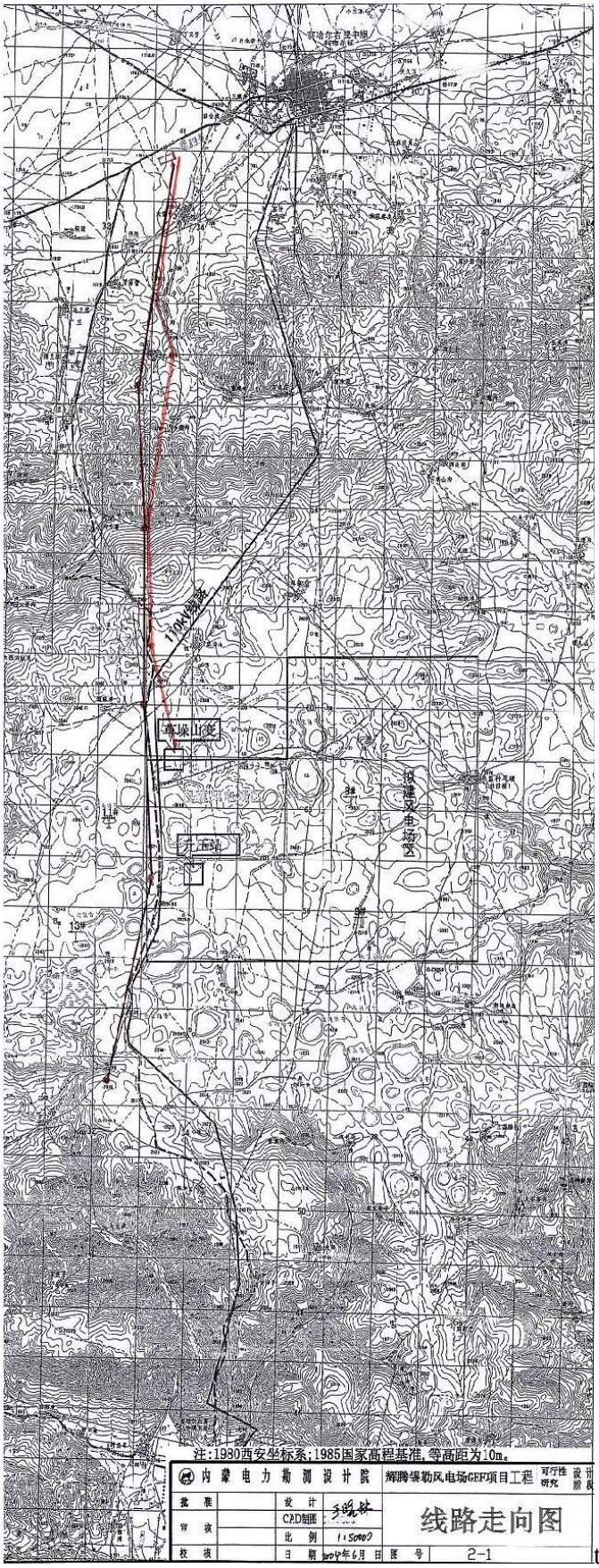
	Agree	38	100
	Indifference	0	0

During the investigation, most investigated people expressed that the project will promote the development of local economy, ensure the sustained development for the economy. All of the investigated people think that the meadow should be protected and the environmental sanitation should be taken care of during construction period, the local residents should be temporarily employed if necessary.

In general, most residents here are careful about and support the project. They also expressed their own opinions on the potential environment impacts that maybe occur during the construction of the project. We have paid attention to them, and effective measures will be taken in the design of the project.

6 Conclusions

The project will select advanced equipments, so the pollutants such as air, liquid or solid wastes will not be produced during the wind power generation, serious electromagnetic interference and sound pollution will not be produced too, so there will be little negative impact on the environment. Furthermore, the wind farm can produce clean and green energy which can replace coal-fired power, greatly reduce pollution of the environment, utilize natural re-generable resources and save non-recoverable fossil fuel resources. Great environment and social results can be achieved from the project, so it is practicable in the view of environmental protection.



the red one is the new line