NANSHA HYDRO POWER PROJECT IN YUNNAN PROVINCE CHINA

Document Prepared by Goldchina Consultancy International Co., Ltd.

Project Title	**Nansha Hydro Power Project in Yunnan Province China**
Version	02.1
Report ID	884-02
Date of Issue	01/09/2022
Project ID	884
Monitoring Period	01/09/2012 to 27/12/2017
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CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Nansha Hydro Power Project in Yunnan Province China (hereafter referred to as "the project") is a newly-built hydropower project. The project involves the installation of three sets 50MW hydro turbine and generator units. The main structures include the dam, pressure pipelines, power plant and main transformers etc. The total installed capacity of the project is 150MW, and the estimated annual grid-connected electricity (EG_y) is 616,314 MWh in the registered PDD.

The electricity generated by the project is supplied to South China Power Grid (SCPG). The emission reductions are achieved by displacing part of the electricity of SCPG, which is dominated by coal-fired power plants. The estimated average annual emission reductions are 519,768 tCO_2e in the registered PDD.

Relevant dates for the project are as follows:

The construction starting date for the project was 18/07/2006.

Commissioning start date for project (the first set of water turbine and generator unit started commissioning): 28/12/2007.

The second set of water turbine and generator unit started commissioning: 17/06/2008.

The third set of water turbine and generator unit started commissioning: 16/08/2008.

The project was registered as a VCS project (VCS 884). The first 10 year renewable crediting period started on 28/12/2007 and expired on 27/12/2017.

During the monitoring period (01/09/2012 to 27/12/2017), the emission reduction achieved by the project in this monitoring period is 2,745,232 tCO_2e. The emission reductions in the monitoring period will be verified and issued under VCS rules.

1.2 Sectoral Scope and Project Type

This category would fall within sectoral scope 1: energy industries (renewable/non-renewable).

Project type: Renewable energy projects.

The project is not a grouped project.

1.3 Project Proponent

Organization name	Honghe Guangyuan Hydro Power Development Co.Ltd

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1.4 Other Entities Involved in the Project

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1.5 Project Start Date

The operation starting date for the project was 28/12/2007.

1.6 Project Crediting Period

The first crediting period under VCS is from 28/12/2007-27/12/2017 (10years, renewable).

The total crediting period under VCS would have been from 28/12/2007-27/12/2037(30 years). However, the project was registered under CDM on 12/01/2009 (CDM ref no.:2133). And the total crediting period under CDM is from 12/01/2009 to 11/01/2030 (21 years).

According to VCS standard, the total crediting period under VCS is from 28/12/2007 to 27/12/2028.

1.7 Project Location

The project is located in Yuanyang County of Honghe Hani & Yi Autonomous State, Yunnan Province China. The geographical coordinates of the project are east longitude 102°51'21" and north latitude 23°13'46".

1.8 Title and Reference of Methodology

1. The baseline methodology: ACM0002: "Consolidated baseline methodology for grid connected electricity generation from renewable sources" version 06, in effect as of 19 May 2006;

2. The tool for demonstration and assessment of additionality: the approved methodology of "the tool for demonstration and assessment of additionality", Version 04.

More information about the methodology can be obtained at:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

1.9 Participation under other GHG Programs

The project has been registered as a CDM project with registration number 2133 and VCS project (project ID: 884).

1.10 Other Forms of Credit

The project has not created any other form of environmental credit during this monitoring period, which will be verified by VVB.

1.11 Sustainable Development Contributions

The project contributes to the sustainable development to both local, global and the host country in a number of ways:

(1) The project will supply enough clean electricity for industry development in Honghe Hani & Yi Autonomous State.

(2) To create new job opportunities for the local people: temporary job opportunities will be available during the construction period and 49 permanent jobs during the operation time.

(5) After the operation of the project, the local people can make good use of electricity instead of biomass, especially firewood, which can reduce the breakage to local vegetation and environment protection.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7	Ensure access to affordable, reliable, sustainable and modern energy for all	Implemented activities to increase	Provide 3,255,154.43 MWh clean electricity in this monitoring period	With 150MW installed capacity and 616,314 MWh clean electricity supply, the project ensure access to affordable, reliable, sustainable and modern energy for all. Especially supply enough clean electricity for industry development in Honghe Hani & Yi Autonomous State. To displace part of the electricity from coal-fired power plants, and thus will avoid environmental pollution caused by coal burning.
2)	8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Implemented activities to increase	No further changes this monitoring period	Create 49 permanent jobs during the operation time.
3)	13	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By displacing fuel fired electricity, reduce 2,745,232 tonnes of CO_2 emission.	Reduce 519,768 tCO_2e annually over the project lifetime.

2 SAFEGUARDS

2.1 No Net Harm

There is no net harm.

The Environmental Impact Assessment (EIA) for the proposed project was carried out by Zhujiang Water Resource Protection Science Institute, which is a grade A environment impact assessment entity certified by the State Environmental Protection Administration. The EIA report was approved by National Environmental Protection Bureau on 10/08/2005. Combined with the EIA report, the influences of the project on the environment are summarized as follows in the construction period and the operation period.

1. Construction Phase

Water Influence

The waste water is mainly from the life of the constructors and the waste water because of washing, the soil machining system and machine repair system. The waste water from life will be treated by septic tank and purification pool. The waste water from production will be treated by natural deposition, three levels of flocculating deposition pool. After the treatment, the waste water can reach 2nd level standard of GB8978-1996.

Air Influence

The air pollutants and the dust are from fuel firing, blasting, concrete mixing, rock crashing and vehicle transportation. Although the atmospheric diffusion condition is poor, the project covers a small range and this kind impact is temporary which will disappear with the end of construction activities. The daily sprinkling of the roads and the construction sites will be done to keep the humidity of the project sites. After the treatment, the gas emissions can reach the standard in GB16297-1996.

Noise Influence

The noise is mainly from traffic vehicle and construction machinery. Because the construction time and peak construction period is relatively short, labour protection and other appropriate measures can be taken to reduce the negative impact of noise on the environment. The construction units should make full use of the advanced equipment with low-noise standards in line with the national standards. Maintenance should be made to strengthen the construction machinery to avoid adding mechanical noise because of poor performance. The strong labor protection will be strengthened to prevent excessive noise impact on the health of construction workers. The anti-noise helmets, earplugs or earmuff should be wearied. The signs will be set up at the higher flow of traffic crossing to prevent traffic chaos causing human pollution. The noise control standards at the construction sites can reach "Construction Sites Noise Limits" (GB12523-90).

Solid Wastes Influence

The solid wastes during construction period are from production wastes and living wastes. The production wastes are soil and residues during excavation. The Living wastes are mainly generated by the life of the constructors. The solid waste plant will be treated in strict accordance with the requirements of the Soil and Water. Conservation to avoid water and soil erosion problems. The living wastes should be concentrated to be treated, and garbage bin will be set up in the construction living quarters to prohibit throwing garbage. Liquid medicine should be sprayed to prevent the breeding of mosquitoes and avoid mosquito gathered and reduce the probability of spreading diseases. The wastes will be regularly transported to a nearby garbage dump or buried treatment.

2. Operation Phase

Zoology

The releasing flux is bigger than 26.1m3/s, which can make the water utilization in the backward position of Hong River plentiful. Immigration allocation and land occupation It is estimated that 853 inhabitants need to resettle and 3.52 km^2 previously used land is submerged due to the project. Two allocation sites (Immigration New Village and Guanting Town) are arranged and constructed. It was planned that 248 migrants would be resettled in Guanting Town, and 605 migrants would be resettled in Immigration New Village. They are compensated with subsidies, house and farmland etc. The project owner has signed the Agreement of Immigrates Allocation and Compensation with the People's Government of Honghe Hani & Yi Autonomous State and has invested RMB 98.0472 million yuan as immigration compensation. At the same time, the project owner signed the Compensation Agreement for Occupied Land and Demolition with each affected villagers. Furthermore, according to Resettlement Plan of the project, through compensations in forms of subsidies, house, farmland etc., the living and product activity of all resettled people have been well arranged. Transportation (five roads and two bridges built), electricity supply facilities (four electricity transmission lines built), communication facilities (three communication lines built), water supply (two water pipelines built), education and medical care have been well arranged. Thus, life quality improved compared with that before resettlement.

On transboundary impacts

Hong River is one of the international rivers in the southwest of China, and it is originated from Weishan County Yunnan Province and flow to Vietnamese at the Hekou County Yunnan Province. Although the project is on Hong River and is 110km away from the exit to Vietnamese, there are the following reasons to show that it will have little impacts on Hong River:

(1) It is the run-of-river hydropower project resulting little impact on the Hong River and environment.

(2) During the distance of 110 km from the project and the exit to Vietnamese, there are four big branch river will import to Hong River which can add the water flux of Hong River.

(3) 26.1 m^3/s of ecological flux will be ensured according to the approved document for the EIA.

So, the project will result in little impact on Hong River and there is none of transboundary impacts.

The waste water management

The waste water in the operation phase is from life, which was treated by septic tank and purification pool. After the treatment, the waste water can reach 2nd level standard of GB8978-1996. The the treated waster water was used as the greening water.

The hazardous waste management

About 5 barrels of waste fossil oil such as waste machine oil, Lubricating oil, generated annually. The project owner had signed the hazardous waste treatment contract with Yunnan Xinhao Environment Protection Technology Co., Ltd(the hazardous waste treatment certficate: Y5304250103)(Xinhao for short). All hazardous waste from the project was collected by the project owner and transported by Xinhao to the treatment plant of Xinhao for recycling.

Wild Fish Management

As per Acceptance opinions on completion environmental protection of the project on 17/08/2020, the wild fish was breed and release as follow measures:

In July 2016, August 2017, August 2018 and November 2019, Cyprinus carpio rubrofuscus, oryzias sinensis, and semilabeo obscurus were released at 3km on the left bank of the dam upstream of the project. A total of 500,000 fish were released, and 17000 fish were marked.

In 2019 and 2020, under the witness of the notary office and the fishery administration department, two artificial net catches and release to the upstream of the dam were carried out. In 2019, a total of 10 species of wild fish were caught in the downstrem of the dam, with a total weight of 78.6kg and a total of 565 fish, mainly including Pelteobagrus vachelli, Clarias fuscus, Mystus guttatus, Hemibagrus pluriradiatus, Leiocassis longirostris, Bagarius rutilus, Cyprinus carpio rubrofuscus, carp, crucian carp, grass carp, etc. In 2020, a total of 12 species of fish were caught, with a total weight of 66.8kg, with a total of 546 fish, mainly including Pelteobagrus vachelli, Clarias fuscus, Mystus guttatus, Hemibagrus pluriradiatus, Leiocassis longirostris, Bagarius rutilus, Cyprinus carpio rubrofuscus, carp, crucian carp, grass carp, Mylopharyngodon piceus, Onychostoma gerlachi , etc. Centralized release activities was implemented at Jinxia wharf, 3 km up the dam of the project.

In May 2019, the artificial fish nest of with the total area of500m^2 was installed in at Jinxia wharf. The total number of fish eggs attached to the artificial fish nest reached 3516800, and the total hatching rate was 56.5%. According to the estimation of 5% survival rate of fish fry, the artificial fish nest can reproduce 99350 fish fry in 2019.

2.2 Local Stakeholder Consultation

There are three phases for inviting the comments of the stakeholders.

The first phase of inviting the comments was done in June 2005 by Zhujiang Water Resource Protection Science Institute during designing EIA report, which emphasized on the comments for environmental impact.

The second phase of inviting the comments was carried out from 01/03/2006 to 17/03/2006 by the project owner and the local Town Committee in Yuanyang County and Jianshui County, which emphasized on the comments whether the proposed project was supported for applying for CDM.

The third phase of inviting the comments was carried out during validation of the proposed project in year 2007, which emphasized on the comments from the 183 families of the immigrates whose houses and farmlands were submerged and occupied.

In the first phase, in order to know the attitudes and views of the public on the project's construction influence on the surrounding environment, the proposed project has taken the form of public participation in two ways of visiting experts and holding meetings in Nansha Town, Zhaidao Village, Zhala Village and Yuni Village around the project area. As for the special persons, both visiting experts and holding meetings are adopted, and as for the normal people handing out questionnaires is adopted. The investigation content includes the knowledge of the proposed project, the effect on the environment, social economy development and the immigrants.

In the process of investigation, the experts on hydro power technology, environmental protection and social study were invited to participate two small meetings. The suggestions and opinions on hydrophily environmental protection and land environment were consulted.

As for the normal people, the total of 125 copies of this questionnaire had been handed out and 105 were recovered, so the recovery rate is 84%. The amount of effective questionnaire is 100. The information for the public in the survey statistics are as follows:

Table E1 The age distribution of the public

Age	Year 19~29	Year 30~40	Year 41~45	Year 46~66
Persons	28	34	21	17
Share (%)	28	34	21	17

Table E2 the career distribution of the public

Careers	Cadres	Workers	Teachers	Technicians	Farmers	Students	Others
Persons	20	15	5	28	15	5	12

Share (%)	20	15	5	28	15	5	12

Table E3 the civilization distribution of the public

Civilization degree	Higher than junior college	Technical Secondary school	Senior high school	Below junior high school
Person	30	25	20	25
Share (%)	30	25	20	25

In the second phase, the proposed project owner and the local Town Committee together handed out "the letter to solicit the opinions about the proposed project applying for CDM"on 01/03/2006. The opinions and suggestions of the public were welcome in this letter. If there are some suggestions and opinions, these opinions can be submitted to the Town Committee within 15 workdays. The local Town Committee and the proposed project owner collected the opinions and formed the "Feedback Opinions about the proposed project applying for CDM"which was signed by the 18 villagers from Yuni Village Jianshui County and 9 villagers from Wuwan Village Majie Town in Yuanyang County.

In the third phase, 76 questionnaires were handed out to 76 families from Geshi in Potou Town, 16 questionnaires were handed out to 16 families from Jianghezhai in Potou Town, 44 questionnaires were handed out to 44 families from Yuni in Potou Village, and 47 questionnaires were handed out to 47 families from Zhala in GuantingVillage. The houses and farmlands of the above 183 families were submerged or occupied. The questionnaire emphasized the following aspects:

- The type of immigrate allocation;
- Whether to be satisfied with the immigrate allocation scheme;
- Whether to be satisfied with the compensation standard;
- Whether to have got the compensation fee;
- Where to live on after immigrations;
- Whether the life has security after immigrations;

・Whether the life has been improved after immigrations;

How about the condition of medical care, transportation, communication and education for children compared to the past; The result of comments from the first phase is as follows which is shown in EIA report:

125 questionnaires were distributed to the local people, and 105 questionnaires had been returned. The response rate is 84%.

1. Comments from these questionnaires for normal local people are summarized:

1) the opinions about the project engineering

85% of the public have known the proposed project. 75% of the public agreed on the construction of the proposed project and 12% had no opinions about the proposed project and 13% of the public had negative attitudes about the project because they thought the compensation can't meet the requirement of immigration and settle down. 65% thought the construction of the proposed project will play an important part in general development of the local area, and 70% of the public thought the proposed project will boost the economy development, and 63% thought the proposed project can improve the water supply of the backward position of the river and the country, and 65% thought it can improve the water quality, and 56% thought it can increase the life level and 30% thought it can improve the transportation condition.

2) The effect on the environment after the reservoir construction

45% thought the proposed project will improve the environment quality, 45% thought it will have small impacts on environment but can be controlled and reduced by adopting related measures, and 10% thought it will have impacts on environment. 60% thought the reservoir will not generate water body pollution, 72% thought the immigrants are the biggest problem. 65% thought the proposed project will flood the soil and forest. 20% thought flooding would impact the animals and plants. 72% thought the solid waste is the main environment during construction. 45% thought construction will destroy the vegetation.

3) the opinions about the natural scene

48% thought construction of the proposed project will have no direct impact on the scene of both banks and 31% thought the proposed project will have positive impact on local area, 21% with negative impact. Most of the people thought the proposed project would be constructed on reasonable argumentation.

2. Comments from these questionnaires for experts are summarized:

The triphibian and hydrophily zoology and the minority heritage are emphasized by experts, and most of the experts thought this issue must be emphasized from natural environment, culture

and science. Through analysis of the impact on natural scene, all of them thought the proposed project has no big impact on scene.

From the above analysis, most of the public hold the positive attitude for the proposed project. Therefore, the local people supported the construction of the proposed project, and they figured out that the power plant had positive meaning for local economy development. They had a positive and optimistic attitude for the environmental impacts because of the construction of the proposed project. The public generally hope that the project will start as soon as possible in order to spur local economic development, increase incomes and social benefits.

The result of comments from the second phase is as follows which is shown in the Feedback Opinions Paper:

In the Feedback Opinions Paper on 17th March 2006, all the public thought that the proposed project makes good use of the water resource to generate electricity and supply the electricity to the local areas, and the proposed project supplies several jobs for local people. The operation of the proposed project will reduce the GHG emissions from fossil fuels. The proposed project will not emit the waste water and waste gas. The local people supported the proposed project applying for CDM and supported the construction and operation of the proposed project.

The result of comments from the third phase is as follows which is shown in the 183 questionnaires from Geshi, Jianghezhai, Yuni in Potou Town and Zhala in Guanting Eown:

Item	Questions	Choices	Geshi	Jiangbianzhai	Yuni	Zhala	Total	Share (%)
1	The type of allocation	"Houkao"	/	/	/	47	47	25.68
		Allocated in the local areas	76	16	44	/	**136**	74.32
		Immigrated to other places	/	/	/	/	**0**	0
2	Weather to be satisfied with the immigrate allocation scheme	Satisfied	22	/	27	3	**52**	28.42
		Basically satisfied	53	16	16	44	**129**	70.48
		Not Satisfied	1	/	1		**2**	1.10

3	Whether to be satisfied with the compensation standard	Satisfied	6	/		1	7	3.83
		Basically satisfied	65	16	44	46	171	93.44
		Not Satisfied	5	/	/	/	5	2.73
4	Whether to have got the compensation fee	Got all	/	/	/	/	/	0
		Got a part	76	16	44	47	183	100
		Got none	/	/	/	/	/	0
5	Which to live on after immigration	Agricultural production	72	15	39	47	173	94.54
		Employment	2	/	/	/	2	1.09
		Others	2	1	5		8	4.37
6	Whether the life has security after immigration	Had security	50	8	12	31	101	55.19
		Had basic security	26	8	32	16	82	44.81
		Had none security	/	/	/	/	0	0
7	Whether the life has been improved after immigration	Improved	52	16	36	47	151	82.51
		None of improvement	24	/	5	/	29	15.85
		Worsen	/	/	3	/	3	1.64
8	How about the condition of medical care	Improved	65	16	40	47	168	91.80
		None of improvement	11	/	4	/	15	8.20

	compared to the past	Worsen	/	/	/	/	0	0
9	How about the condition of transportation and communication	Better	76	16	43	47	182	99.45
		The same	/	/	/	/	0	0
		Worsen	/	/	1	/	1	0.55
10	Whether to be satisfied with the education condition for the children	Satisfied	67	12	37	47	163	89.07
		Basically satisfied	8	4	6	/	18	9.84
		Not Satisfied	1	/	1	/	2	1.09

From the above table, it can be shown that:

All the 47 families (25.68%) from Zhala have been immigrated to Guanting Town as "Houkao"; 136 families (74.32%) from Geshi, Jiangbianzhai and Yuni have been allocated in the local area "Immigration New Village";

98.9% thought they were satisfied with the immigrate allocation scheme;

97.27% thought they were satisfied with the compensation standard;

100% thought they had got part of the compensation fee;

94.54% lived on agricultural production after immigration; 1.09% lived on through employment after immigration; 4.37% lived on other life sources after immigration;

100% thought their life had security after immigration;

98.36% thought their life had been improved after immigration;1.64% thought the life had been worsen after immigration;

100% thought the condition of medical care had been improved or not been worsen compared to the past;

99.45% thought the condition of transportation and communication had been better or the same; 0.55% thought the condition of transportation and communication had been worsen;

98.91% thought they were satisfied with the education condition for the children; 1.09% thought they were not satisfied with the education condition for the children.

The project owner took the public comments and feedback seriously and took prompt and proper action in response to the stakeholders ' comments and suggestions, especially on the immigration problem.

The survey during the first phase shows that the main problem is that some people were worried that the compensation can't meet the requirement of immigration and settle down. For this worry, the project owner has signed the Agreement of Immigrates Allocation and Compensation with the People's Government of Honghe Hani & Yi Autonomous State and has invested RMB 98.0472 million yuan as immigration compensation. The project owner and the government worked together and they had the pressure and responsibility to carry out all items set in the Agreement of Immigrates Allocation and Compensation.

And there are none of negative comments during the second phase.

As for the third phase, the project owner has been doing the coordination work and arrangement for a few families who had the negative attitude for immigrate allocation scheme, the compensation standard and the life condition with the People's Government of Honghe Hani & Yi Autonomous State.

Totally 30 pieces of questionnaires paper have been handed out and taken back, and the summary of the comments received is presented as follows:

(1) 70% of the respondents are males, and the rest are females;

(2) 10% of the respondents are younger than 30 years old, 60% of the respondents are between 30 - 50 years old, 30% are older than 50 years old;

(3) 10% of the respondents are the education degree of primary school, 16.67% are the education degree of junior middle school, 60% are the education degree of senior middle school, 13.33% are the education degree of above senior high school;

(4) 100% of the respondents are satisfied with current living environment.

(5) 100% of the respondents know the technical of natural gas power generation.

(6) 100% of the respondents know about the project activity.

(7) 100% of the respondents consider that the project activity will promote the development of local economy, 70% consider that the project activity will increase the living level, 80% consider

that the project activity will expansion the job opportunity, 90% consider that the project activity will increase the individual income.

(8) 90% of the respondents consider that the project activity will make more benefits than its absence, the rest consider no comments.

(9) 100% of investigators consider that the proposed project has no negative impact.

(10) 100% of the respondents support the construction and operation of the project.

The project owner took the public comments and feedback seriously and took prompt and proper action in response to the stakeholders ' comments and suggestions, especially on the immigration problem.

During project implementation phase, there is a public comments collection and feedback book for the project. The local stakeholders can leave their opinions, comments and concerns on the project and contact information in the public comments collection and feedback book at any time. The project owner will contact the local stakeholder to give feedback within two weeks. So far, no public comments about potential negative impacts during project implementation have been received by the project owner.

2.3 AFOLU-Specific Safeguards

The project is not AFOLU projects.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project is a newly-built hydropower station. The main structures include the dam (The dam consists of non flooding dam segment, flooding dam segment, flooding discharge bottom hole and water diversion dam), pressure pipelines, power plant and main transformers etc. It involves the installation of three sets 50MW hydro turbine and generator units. The basic parameters of the installed equipments are as follows:

Table 1 The main parameters of the installed equipments

Hydro turbine	Model:	HL-LJ-420
	Number:	3
	Rated water head:	44.5m
	Rated flow:	129.92 m^3/s

	Rated capacity:	51.546 MW
Generator	Model:	SF50-52/9200
	Number:	3
	Rated capacity per unit:	50 MW
	Rated voltage:	10,500 V
	Rated capacity factor:	0.85
	Rated rotating speed:	115.4 r/min
Main transformer	Model:	SF10-6300kVA/110kV
	Number:	3

The technical process diagram of the project is as follows:

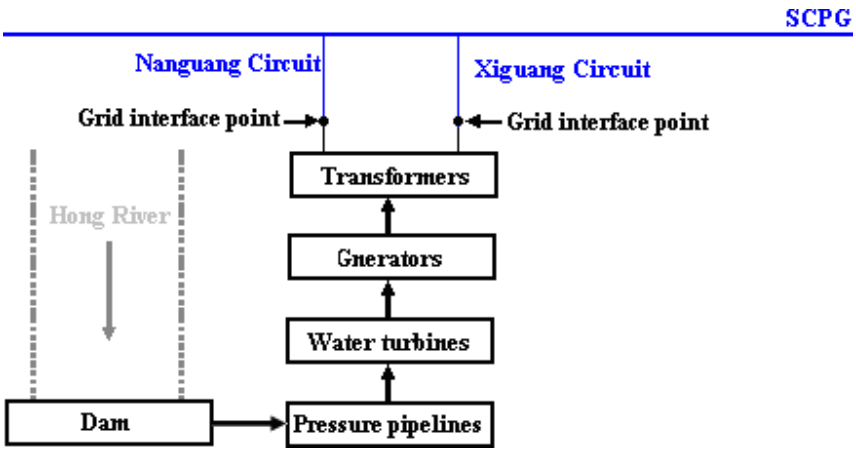


Figure 1 The technical process diagram

The construction of the project started on 18/07/2006. The first set of water turbine and generator unit started commissioning on 28/12/2007, the second on 17/06/2008, and the third on 16/08/2008. All facilities and equipments have been installed as described in the registered PDD.

For the dispatching management of local power grid, Xiguang Circuit was renamed as Guangdian Circuit by the gird company on 05/01/2011. The renaming has no impact on the monitoring system as well as the monitoring of the emission reductions. This has been confirmed in the document "Notice on renaming of Xiguang Circuit" (Hongdiandiao[2011] No.1) issued by the grid company 05/01/2011. To keep consistency with the overall description in the monitoring plan, the name of Xiguang Circuit is still used.

Over this monitoring period, the hydro turbine and generator units and the monitoring meters operated normally, no malfunction or replacement of the equipment took place. Moreover, no events or situations have occurred during this monitoring period that could have impacted the applicability of the applied methodology.

3.2 Deviations

2.1.1 Methodology Deviations

There is no deviation applied to this monitoring period.

2.1.2 Project Description Deviations

The project was registered under VCS standard 3, according to VCS standard 3, the crediting period of the project activity is 10 years and could be renewed twice, as the project started operation which is also the start date of the project was 28/12/2007, therefore the first crediting period for project under VCS should be from 28/12/2007 to 27/12/2017.

3.3 Grouped Projects

The project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	NCV_i
Data unit	MJ/t, or MJ/km^3
Description	the net calorific value per mass or volume unit of a fuel i
Source of data	China Energy Statistical Yearbook（2006）
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	The data is ex ante determined in the registered PDD and fixed for the first crediting period.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{CO2,I}$
Data unit	tC/TJ (can be transformed to tCO2e/TJ)
Description	Emission factor per unit energy of fuel i
Source of data	Defaults on page 1.23～page 1.24 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	2006 IPCC defaults
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$OXID_i$
Data unit	%
Description	the oxidation rate of the fuel i
Source of data	Defaults on page 1.23～page 1.24 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	2006 IPCC defaults
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$F_{i,j,y}$
Data unit	Mass or volume unit of fuel i
Description	the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y
Source of data	China Energy Statistical Yearbooks(2004,2005,2006)
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	In accordance with the requirements of the latest version of ACM0002.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$G_{j,y}$
Data unit	MWh
Description	Power generation of sources j in year(s) y
Source of data	China Electric Power Yearbook(2004,2005,2006)
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	In accordance with the requirements of the latest version of ACM0002.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$e_{j,y}$
Data unit	%
Description	Self-consumption rate of electricity of sources j in year(s) y
Source of data	China Electric Power Yearbook(2004,2005,2006)
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	In accordance with the requirements of the latest version of ACM0002.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$CAP_{y,j}$
Data unit	MW
Description	The installed capacity of every kind of electricity generation (such as thermal power, hydro power, nuclear power, wind power and other energy sources etc.) of South China Power Grid in the recent years. And to find the change of capacity additions in the South China Power Grid in the past few years.
Source of data	China Electric Power Yearbook
Value applied	See Annex 3 of the registered PDD
Justification of choice of data or description of measurement methods and procedures applied	This kind of data accords with the latest version of ACM0002 and the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.
Purpose of Data	Calculation of baseline emissions

Comments	-

Data / Parameter	**GENEbest ,coal**
Data unit	%
Description	The maximized efficiency of coal-fired power supply
Source of data	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied	36.53
Justification of choice of data or description of measurement methods and procedures applied	Specific national value
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	**GENEbest ,oil / gas**
Data unit	%
Description	The maximized efficiency of oil and gas-fired power supply
Source of data	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied	45.87
Justification of choice of data or description of measurement methods and procedures applied	Specific national value
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	**$EF_{OM,y}$**
Data unit	tCO_2e/MWh
Description	OM emission factor of South China Power Grid
Source of data	China's DNA : Report on Determination of Baseline Grid Emission Factor issued on 9th August 2007 and the annex 3 of the PDD
Value applied	1.0119
Justification of choice of data or description of measurement methods and procedures applied	Specific national value
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{BM,y}$
Data unit	tCO_2e/MWh
Description	BM emission factor of South China Power Grid
Source of data	China's DNA : Report on Determination of Baseline Grid Emission Factor issued on 9th August 2007 and the annex 3 of the PDD
Value applied	0.6748
Justification of choice of data or description of measurement methods and procedures applied	Specific national value
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EFCM ,y
Data unit	tCO2e/MWh
Description	CM emission factor of South China Power Grid
Source of data	The registered PDD
Value applied	0.84335
Justification of choice of data or description of measurement methods and procedures applied	The data is ex ante determined in the registered PDD and fixed for the first crediting period.
Purpose of Data	Calculation of baseline emissions
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ\ to\ SCPG,y}$
Data unit	MWh
Description	Annual Grid-connected power generation of the proposed project to South China Power Grid
Source of data	Meter records
Description of measurement methods and procedures to be applied	Measured

Frequency of monitoring/recording	Continuous measurement and at least monthly recorded
Value monitored	3,337,705.36
Monitoring equipment	

Meter	M1	M3	M2	M4
SN	206659001 214127481 (replaced 206659001 on 31/12/2015)	206659280 214127489 (replaced 206659280 on 31/12/2015)	206659630 214597130 (replaced 206659630 on 31/12/2015)	206659002 214127467 (replaced 206659002 on 31/12/2015)
Location	Nanguang Circuit		Xiguang Circuit	
Model/Type	MK6E, 3×57.7V, 3×1(6)A			
Accuracy class	0.2S			
Calibration	19/10/2007 (for meter 206659001,206659280, 206659630 and 206659002) 29/09/2012 (for meter 206659001,206659280, 206659630 and 206659002) 29/12/2015 (for meter 21412748, 214127489, 21459713, 214127467)			
Validity period	19/10/2007~18/10/2012 (for meter 206659001, 206659280,206659630 and 206659002) 29/09/2012~28/09/2017 (for meter 206659001, 206659280, 206659630 and 206659002) 31/12/2015-30/12/2020 (for meter 21412748, 214127489, 21459713, 214127467)			
Calibration frequency	At least once every five year in accordance with the national standard- "Verification Regulation of Electrical Energy Meter with Electronics JJG 596-1999"			
Calibration entity	Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd.			

Meter	M5	M6	M7
SN	20070940010005	20070940010006	20070940010007

	Location	1# Generator	2# Generator	3# Generator
	Model/Type	DTSD341		
	Accuracy class	0.5S		
	Calibration	30/09/2007, 29/09/2012, 28/09/2017		
	Validity period	30/09/2007 ~29/09/2012 29/09/2012~28/09/2017 28/09/2017~27/09/2022		
	Calibration frequency	At least once every five year in accordance with the national standard- "Verification Regulation of Electrical Energy Meter with Electronics JJG 596-1999" and "Verification Regulation of Electrical Energy Meter with Electronics JJG 596-2012"		
	Calibration entity	Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd.		
QA/QC procedures to be applied	$EG_{PJ\ to\ SCPG,\ y}$ from meter records should be double-checked against the electricity sales receipts, and they should be fully consistent.			
Purpose of the data	Calculation of baseline emissions			
Calculation method	-			
Comments	-			

Data / Parameter	$EG_{SCPG\ to\ PJ,\ y}$
Data unit	MWh
Description	The annual amount of power supplied by the South China Power Grid Corporation to the proposed project
Source of data	Meter records
Description of measurement methods and procedures to be applied	Measured
Frequency of monitoring/recording	Continuous measurement and at least monthly recorded
Value monitored	82,550.93

Monitoring equipment	<table><tr><td>Meter</td><td>M1</td><td>M3</td><td>M2</td><td>M4</td></tr><tr><td>SN</td><td>206659001</td><td>206659280</td><td>206659630</td><td>206659002</td></tr><tr><td>Location</td><td colspan="2">Nanguang Circuit</td><td colspan="2">Xiguang Circuit</td></tr><tr><td>Model/Type</td><td colspan="4">MK6E, 3×57.7V, 3×1(6)A</td></tr><tr><td>Accuracy class</td><td colspan="4">0.2S</td></tr><tr><td>Calibration</td><td colspan="4">19/10/2007 (for meter 206659001,206659280, 206659630 and 206659002) 29/09/2012 (for meter 206659001,206659280, 206659630 and 206659002) 29/12/2015 (for meter 21412748, 214127489, 21459713, 214127467)</td></tr><tr><td>Validity period</td><td colspan="4">19/10/2007~18/10/2012 (for meter 206659001, 206659280,206659630 and 206659002) 29/09/2012~28/09/2017 (for meter 206659001, 206659280, 206659630 and 206659002) 31/12/2015-30/12/2020 (for meter 21412748, 214127489, 21459713, 214127467)</td></tr><tr><td>Calibration frequency</td><td colspan="4">At least once every five year in accordance with the national standard -“Verification Regulation of Electrical Energy Meter with Electronics JJG 596-1999”and “Verification Regulation of Electrical Energy Meter with Electronics JJG 596-2012”</td></tr><tr><td>Calibration entity</td><td colspan="4">Electric Power Research Institute of Yunnan Electric Power Test & Research Institute (Group) Co., Ltd.</td></tr></table>
QA/QC procedures to be applied	EG $_{PJ\ to\ SCPG,\ y}$ from meter records should be double-checked against the electricity sales receipts, and they should be fully consistent.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	-

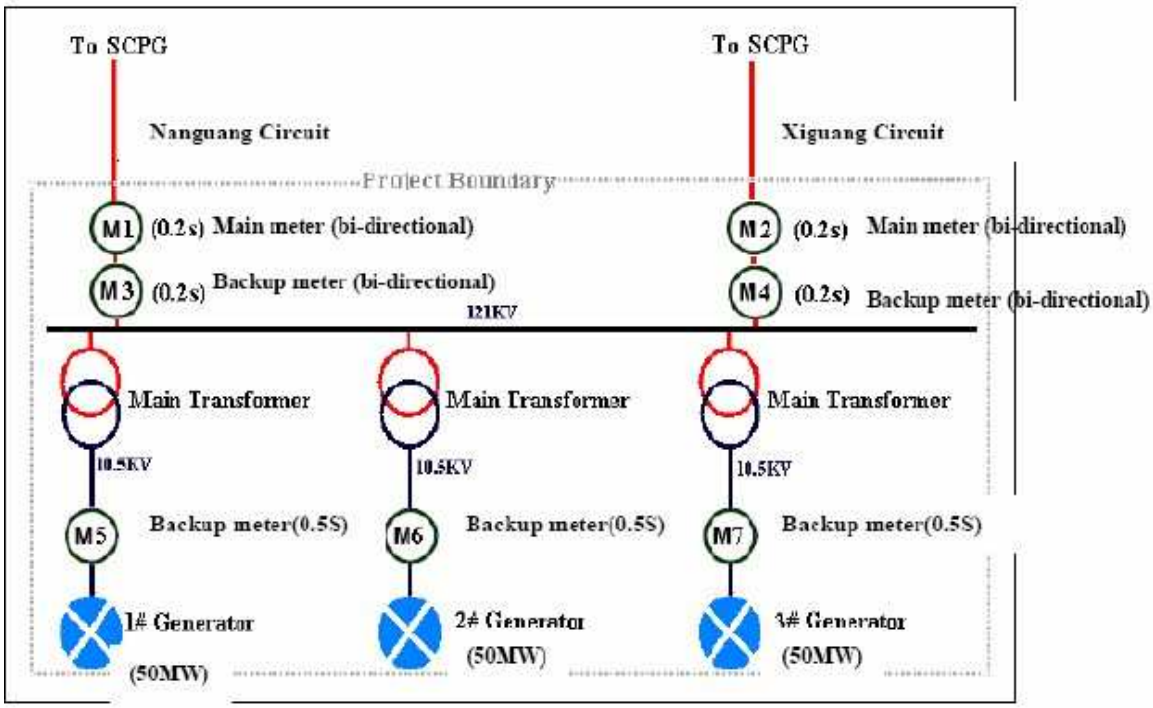
Data / Parameter	A_{PJ}
Data unit	m^2

Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site
Description of measurement methods and procedures to be applied	A_{PJ} has been measured through an engineering survey by Zhujiang Water Resource Protection Science Institute and the project owner at the start of the operation of the project.
Frequency of monitoring/recording	Measured once at the start of the operation of the project.
Value monitored	8,930,000
Monitoring equipment	-
QA/QC procedures to be applied	Zhujiang Water Resource Protection Science Institute is a qualified design institute with A level of Engineering Survey Certificate (190005-kj), and the measured data was cross-checked with the approved FSR.
Purpose of the data	Calculation of project emissions
Calculation method	-
Comments	The 8,938,000 applied in the registered PDD is a estimated value in the feasibility study, the 8,930,000 applied in the monitoring report is the measured result of an engineering survey by Zhujiang Water Resource Protection Science Institute. So, 8,930,000 was used.

4.3 Monitoring Plan

1. Monitoring system

As described in monitoring plan in the registered PDD and Power Purchase Agreement, the electricity generated by the project is connected into the SCPG through Nanguang Circuit and Xiguang Circuit. The exported and imported electricity through each circuit is monitored respectively by the bidirectional meters installed at the 151 Switch of Nanguang Circuit and 152 Switch of Xiguang Circuit.



M1 and M2 are the main meters; M3 and M4 are the backup meters in case of emergency use. M5, M6 and M7 are the backup meters installed at the outlets of the three generators to monitor the electricity generated by each generator. Figure 2 is the monitoring system diagram of the project.

Figure 2 Monitoring system diagram

2. Data collection procedures

EG $_{PJ\ to\ SCPG,\ y}$ and EG $_{SCPG\ to\ PJ,\ y}$ are continuously measured by the meters. At 24:00 on the last day of every month, SCPG and the project owner record and confirm the meter readings jointly in the Monthly Reading Records (MRRs). The grid company issues Electricity Transaction Notes (ETNs) to the project owner. In addition, the daily readings are also recorded by the project owner in daily readings records.

MRRs serve as the basis for ERs calculation; ETNs serve as the electricity sales receipts for cross-check.

3. Organizational structure and responsibilities

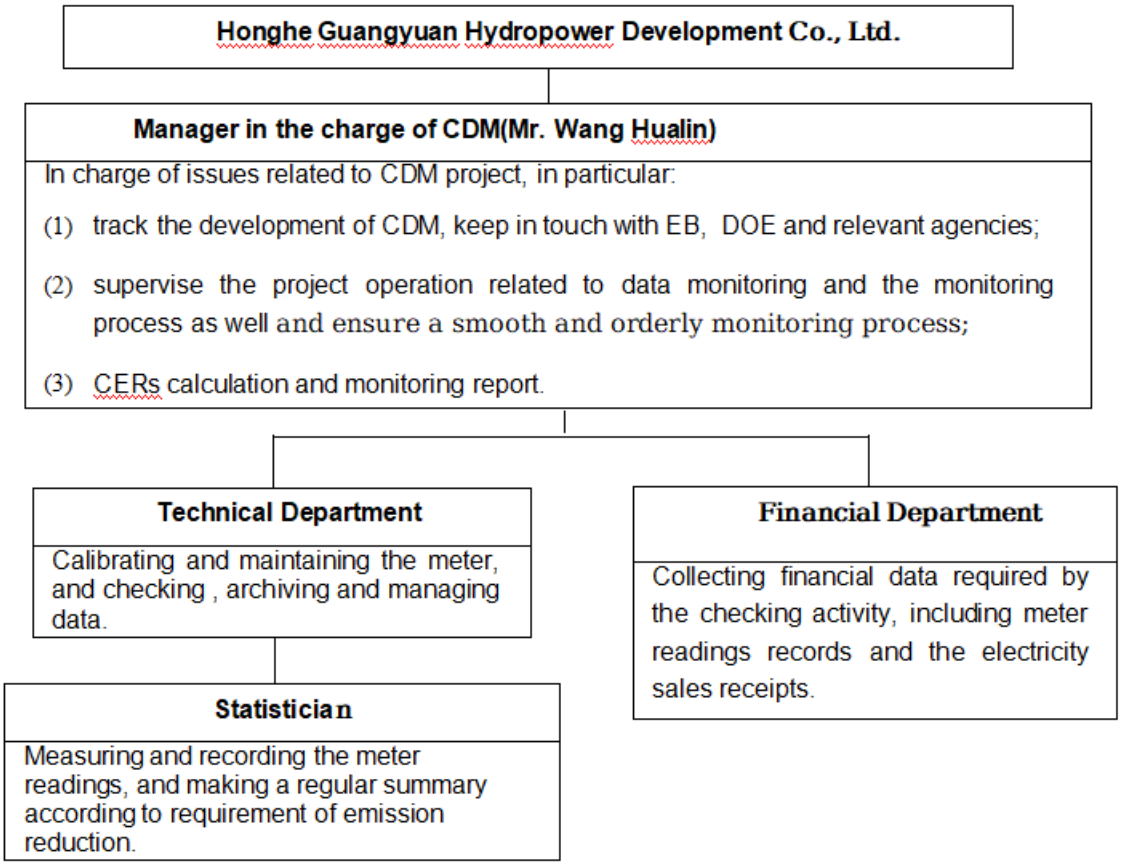


Figure 3 Organizational structure and responsibilities

4. Data archive and data protection procedure

The monitoring data including paper and electronic version, electricity sales/purchase receipts of every month and other CDM related documents should be archived by the project owner. And all of the materials will be kept until 2 years after the end of the total credit period of the project.

5. Internal auditing performed and identified non-conformities identified

The project owner is responsible for the installation of the meters, and the local grid company is responsible for check of the meters and the check record should be provided for the project owner. When there is something wrong with the meters, the project owner should notice the local grid company as soon as possible, and the electricity during the accident should be decided and solved through negotiation by the both parties. During the monitoring period, no wrong with the meters.

At the end of each month, the monitoring data of that month should be archived electronically. E-documents should have disc backups be printed out. The project owner should also keep the copy of electricity sales/purchase receipts. Written documents such as paper-based maps, diagrams and environmental assessments will be used in addition to the monitoring plan to check

the information. In order to facilitate auditors' reference of relevant literature relating to verification of the emission reductions of the proposed project, the index of the project materials and monitoring results should be provided. All paper-based information and data shall be stored by the technology department of the project owner and all the materials shall have copies for backup. And all data will be kept until 2 years after the end of the total credit period of the project.

6. Emergency procedures

In normal condition, meter records from the main meter are used for ER calculation. If the malfunction happened to the main meter, the meter records from the backup meter will be used for ER calculation, and the electricity sales receipts will be kept for cross check. Problem occurred in monitoring and measurement process will be recorded and reported to project manager.

During this monitoring period, the meters operated normally, and no emergency occurred.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions are calculated by multiplying the electricity generated in the project plant (EG_y) with a baseline CO_2 emission factor ($EF_{BL,CO2,y}$), the formulae can be described as follows:

According to the registered PDD, the baseline emissions (BE_y) is calculated as follows:

$$BE_y = EG_y \times EF_{CM,y} = (EG_{PJ\ to\ SCPG,y} - EG_{SCPG\ to\ PJ,y}) \times EF_{CM,y}$$

The detailed calculation procedure is shown in the following table.

Period	$EG_{PJ\ to\ SCPG,y}$ (MWh)	$EG_{SCPG\ to\ PJ,y}$ (MWh)	EG_y(MWh)	$EF_{CM,y}$ (tCO_2e/MWh)	BE_y (tCO_2e)
01/09/2012-31/12/2012	131691.23	9350.88	12340.35	0.84335	103,175
01/01/2013-31/12/2013	349127.57	13807.42	335320.15	0.84335	282,792
01/01/2014-31/12/2014	845874.26	42596.73	803277.53	0.84335	677,444
01/01/2015-31/12/2015	655084.43	14715.14	640369.29	0.84335	540,055
01/01/2016-31/12/2016	604274.00	485.10	603788.90	0.84335	509,205

01/01/2017-27/12/2017	751653.87	1595.66	750058.21	0.84335	632,561
Total	3337705.36	82550.93	3255154.43	0.84335	2,745,232

5.2 Project Emissions

The project is a hydro power project with a new reservoir. As per the nameplates of generators, the installed capacity of the project is 150MW (150,000,000W). According to the measurement results of A_{PJ} issued by Zhujiang Water Resource Protection Science Institute, the measured value of A_{PJ} is 8,930,000m^2, thus the power density of the project is calculated to be 16.8W/m^2 (16.8W/m^2=150,000,000W/ 8,930,000m^2), which is greater than 10W/m^2, so the project emission (PE_y) is 0.

5.3 Leakage

As per the methodology ACM0002 ver. 6, no leakage emissions need to be considered, the leakage (L_y) is 0.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2012	103,175	0	0	103,175
Year 2013	282,792	0	0	282,792
Year 2014	677,444	0	0	677,444
Year 2015	540,055	0	0	540,055
Year 2016	509,205	0	0	509,205
Year 2017	632,561	0	0	632,561
Total	2,745,232	0	0	2,745,232

During this monitoring period from 01/09/2012 to 27/12/2017 (total 1944 days). The actual emission reductions are 2,745,232 tCO_2e. According to the registered PDD, the emission reductions for this monitoring period should be 519,768 tCO_2e annually. The estimated emission reductions are 2,768,298 tCO_2e (=519,768/365*1944).

In comparison, the actual emission reductions are -0.83% lower than the estimated emission reductions in the registered PDD.