Monjolinho Energética S/A Hydropower Plant Project (Alzir dos Santos Antunes)

October 2014

MONEL – Monjolinho Energética S/A

MONEL
MONJOLINHO ENERGÉTICA S/A

&

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A.
PROJECT OVERVIEW

A1. PROJECT TITLE

"Monjolinho Energética S/A HydroPower Plant Project (Alzir dos Santos Antunes)".

A2. PROJECT TYPE

Renewable energy generation connected to the GRID. According to CDM's[1] category of project activity: Sectoral Scope 1 – Energy Industries (Renewable Source).

A3. PROOF OF PROJECT ELIGIBILITY

Proof of project eligibility is presented in TABLE A.1, according to ACR Standard v.3.0, Chapter 3.

***TABLE A.1**: Alzir dos Santos Antunes Hydropower Plant Project proof of eligibility according to ACR Standard.*

CRITERION	ACR REQUIREMENT	PROJECT'S PROOF OF ELIGIBILITY
Start Date	Non-AFOLU projects with a Start Date of 01 January, 2000, or later are eligible for registration. Projects whose Start Date is more than two years prior to the date of listing must provide documentation that GHG mitigation was an objective as of the Start Date.	The project start date is September, 3, 2009. Section H.1 of this document presents evidence that GHG mitigation was an objective as of the Start Date.
Crediting Period	The Crediting Period for non-AFOLU projects shall be seven (7) years, unless otherwise specified in the relevant ACR sector standard or approved methodology.	The crediting period for this project is seven (7) years, with possibility for renewal.
Real	GHG reductions and removals shall exist prior to issuance.	All emissions from the project are being claimed ex-post.
Direct Emissions	Project Proponent shall own, have control, or document effective control over the GHG sources/sinks from which the emissions reductions or removals originate. If the Project Proponent does not own or control the GHG sources or sinks, the Proponent shall document that effective control exists over the GHG sources and/or sinks from which the reductions/removals originate.	All GHG emissions reductions are within project boundary, which is controlled by Monjolinho Energética S/A.
Offset Title	Project Proponent shall provide documentation and attestation of undisputed title to all offsets prior to registration, including chain of custody documentation if offsets have ever been sold in the past.	All necessary documentation is presented on Section G of this document.

[1] CDM – Clean Development Mechanism.

CRITERION	ACR REQUIREMENT	PROJECT'S PROOF OF ELIGIBILITY
Land Title	Proponent should provide documentation and/or attestation of land title.	All necessary documentation is presented on Section G of this document.
Additional	Every project shall use either an ACR-approved performance standard and pass a regulatory surplus test, or pass a three-pronged test of additionality in which the project must: 1) exceed regulatory/legal requirements; 2) go beyond common practice; and 3) overcome at least one of three implementation barriers: institutional, financial or technical.	Project's additionality is demonstrated in Section C, according to ACR's three-pronged test.
Project Baseline Scenario	Project Proponents shall use appropriate methodologies and tools to estimate and update project baselines.	Approved CDM methodology ACM0002, v.15.0 (RB 79) was used, as presented in Section B.
Permanent	For projects with a risk of reversal of GHG emission reductions/removals, Project Proponents shall assess risk using an ACR-approved risk assessment tool.	Avoided GHG emissions from this project are permanent and cannot be reversed once they have occurred, due to the nature of the project.
Net of Leakage	Project Proponents must deduct leakage that significantly reduces the GHG emissions reduction and/or removal benefit of a project.	According to CDM methodology ACM0002, v.15.0, EB 79, leakage must not be considered, as presented in Section E.
Independently Validated and Verified	ACR requires third-party validation and verification, by an ACR-approved verifier, at specified intervals in order to issue new ERTs.	The project was submitted to third-party (Det Nosrke Veritas – DNV) validation and verification after ACR's screening.
Community & Environmental Impacts	Project Proponents shall document in the GHG Project Plan a mitigation plan for any foreseen negative community or environmental impacts, and shall disclose in their Annual Attestations any negative environmental or community impacts or claims of negative environmental and community impacts.	Section F presents an extended discussion about how the project's community and environmental impacts are net positive. There is also a package of evidences to sustain what was said.

A4. LOCATION

The powerhouse of hydropower plant Alzir dos Santos Antunes (from this point, HPP Alzir dos Santos Antunes) is located on Passo Fundo River, sub basin 71, Uruguai River Basin, in the municipalities of Faxinalzinho and Nonoai, State of Rio Grande do Sul, South Region of Brazil, on coordinates 27°20'44" South Latitude and 52°43'52 West Longitude.

Although it is located between the municipalities of Faxinalzinho and Nonoai, the project also presents impacts in the cities of Benjamin Constant do Sul and Entre Rios do Sul, because part of the HPP Alzir dos Santos Antunes's reservoir flooded area is located in these municipalities.

TABLE A.2 shows socio-economic indicators of the municipalities where HPP Alzir dos Santos Antunes is located:

***TABLE A.2**: Social-economic information of HPP Alzir dos Santos Antunes's surroundings.*

Municipality	Total Population (2011)	Area (km²)	Annual GDP per capita (2010)	Illiteracy Rate (2010)[2]	Life Expectancy (2000)
Benjamin Constant do Sul	2,293	132.4	R$ 9,480	13.81 %	64.09
Entre Rios do Sul	3,065	120.4	R$ 42,752	9.13%	67.75
Faxinalzinho	2,553	143.4	R$ 11,524	9.49%	67.75
Nonoai	12,066	469.3	R$ 18,344	11.02%	67.45

FIGURE A.1 presents the location of HPP Alzir dos Santos Antunes.

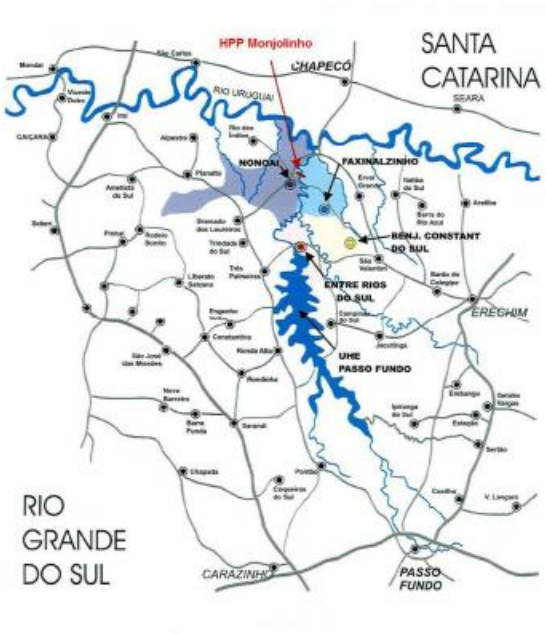

***FIGURE A.1:** Location of HPP Alzir dos Santos Antunes.*

[2] Population older than 15 years old.

A5. BRIEF SUMMARY OF PROJECT

The project activity consists on the supply of clean hydroelectric energy to the Brazilian National Interconnected System (SIN) through the implantation and operation of the hydropower plant Alzir dos Santos Antunes, located in the State of Rio Grande do Sul, Southern Region of Brazil. The plant uses a small reservoir and, therefore, has a low environmental impact.

The main objective of the HPP Alzir dos Santos Antunes implementation is to help fulfilling the growing demand for energy in Brazil, due to its economic and population growth. The supply of renewable energy contributes to the environmental, social and economic development, encouraging sustainability, by increasing the participation of clean and renewable energy in the country's energy matrix.

The baseline scenario is the one that would continue to happen if the project had not been implemented, in other words, the continued generation of fossil fuel based energy to supply the national grid. The project activity reduces GHG emissions by avoiding the electricity generation using fossil fuel sources.

Monjolinho Energética S/A – MONEL is a special purpose company, constituted to build and operate the HPP Alzir dos Santos Antunes as its exclusive owner. The company has a unique shareholder, Desenvix Energias Renováveis S/A.

Desenvix was incorporated in the year 1995 with the purpose of identifying, evaluating and developing business opportunities in renewable energy. During this period, the company has developed and helped implement more than 5,300 MW of power generation, currently in operation in Brazil.

The company is controlled by Jackson Empreendimentos Ltda, SN Power Energia do Brasil Ltda and Fundação dos Economiários Federais – FUNCEF, which holds 40.65%, 40.65% and 18.70% of the total share capital and voting, respectively. They are responsible for capital investments required for the maintenance of the projects activities.

Although recent, the story of Desenvix reflects more than four decades of development and growth of Engevix Engenharia S/A, the flagship company of Jackson Group. Engevix is a Desenvix partner, responsible for preparing the technical evaluation and performing all the engineering of Desenvix projects.

Desenvix currently focuses its activities in the development, deployment and operation of new projects regarding renewable energy generation and transmission of electricity. Currently, its extensive portfolio consists of 17 Priority Projects in Deveopment (owner of 513.2 MW) and 21 Projects in Development (owner of 840.6 MW), resulting in 2960.8 MW owned.

In September 2011, Desenvix has acquired full control of Enex, through which acts as a service provider for operation and maintenance of power plants and electrical system. At the end of March 2013, ENEX had an extensive and diverse client portfolio, totalizing 1,135 MW, with 328 employees, having experienced significant growth in recent years.

A great part of the company's growth is related to its performance in the energy sector. On this matter, Desenvix was created to enable the participation of Engevix in energy generation projects. Acting as holding, the company develops its activities through the controlled companies, which, in turn, exercise the function of independent producers of energy in the national electrical sector.

One of these controlled companies is Monjolinho Energética S/A – MONEL, created specifically to implement HPP Alzir dos Santos Antunes project (FIGURE A.2).

FIGURE A.2:: *Hydropower plant Alzir dos Santos Antunes.*

The referred project contributes to sustainable of its region and country through the following actions:

- The HPP Alzir dos Santos Antunes project dispatches renewable energy to the Brazilian National Interconnected System, displacing possible entrepreneurships that would generate fossil fuel fired energy, avoiding, thus, the emissions of pollutant gases to the atmosphere.
- The project has promoted the generation of approximately 900 direct and indirect jobs and through the boosting of economic activities aggregated to the entrepreneurship's implementation; the project promotes the economic growth of the region through the income generation of the municipalities involved. Furthermore, HPP Alzir dos Santos Antunes project provides financial resources that are reverted into benefits to the region.
- Besides presenting low environmental impacts, due to the small reservoir area combined with an elevated power density, the project invests considerably in environmental programs and actions on the biotic and anthropic environments to mitigate impacts. Two programs can be highlighted: the reforestation programs, with the planting of 250,000 small branches of native species along the riparian zone; and the specific programs of environmental education that will contribute to the awareness of the population in the municipalities involved in the entrepreneurships about Ecological issues.
- Since the HPP Alzir dos Santos Antunes is located in the rural area of Rio Grande do Sul, the implementation of this kind of project demanded training activities for the local collaborators to be hired or sub-hired, what had increased the technical capacity of the population. Through an environmental education program, activities along with the scholar community of the municipalities within the project's direct influence are carried out, besides activities aiming to train the sub-hired companies and educational activities with residents of the reservoir's surroundings. Moreover, Engevix S/A has a human resources politics that aims the qualification of all collaborators of the companies in the group, which also applies to HPP Alzir dos Santos

Antunes employees, contributing to the growth of knowledge and to the level of education of the municipalities where it acts.

- Investments in cultural and social responsibility programs are part of the company's mission and are carried out in HPP Alzir dos Santos Antunes project. Through Engevix Institute, the group promotes investments mainly in children education, through social-educative and professionalizing workshops. Furthermore, for over 25 year Engevix has been developing all kinds of programs culture related, particularly in the arts and music segments. This way, in the HPP Alzir dos Santos Antunes project investments on social and cultural projects continue to happen through an specific funding line of BNDES – National Bank of Economic and Social Development, which provided an amount of R$ 2 million for investments in social programs to be developed with the entrepreneurship's implementation.

A6. PROJECT ACTION

The HPP Alzir dos Santos Antunes uses Passo Fundo River's hydraulic potential to generate electricity, with an installed capacity of 74MW. **The HPP Alzir dos Santos Antunes is a run-of-river hydroelectric power plant with a small reservoir, with 5.46km².** The project substitutes the baseline scenario, which is that one existing prior to the project implementation: the continued use of fossil fuel for power supply.

At the time of the project implementation (2008), according to ANEEL[3], there were the following number of electricity generation entrepreneurships in operation in the South Region of Brazil, where the project takes place:

- 87 hydropower plants with installed capacity smaller than 1 MW;
- 07 wind power plants;
- 87 small hydropower plants with installed capacity greater than 1 MW and smaller than 30 MW;
- 38 hydropower plants with installed capacity greater than 30 MW;
- 79 thermal power plants.

It is important to highlight that just twelve[4] hydropower plants above 30MW were not built by State-owned entities in the region. In addition, Rio Grande do Sul State (project location) had only five hydropower plants above 30MW not built by State-owned entities, proving that this kind of activity was not a common practice in the State.

The Basic Project of HPP Alzir dos Santos Antunes was approved in May 22, 2007. Initially, the authorized installed capacity was 67 MW, but later, in June 4, 2008, ANEEL (National Agency of Electric Energy) approved an increase to 74 MW, which is the official installed capacity as shown at the evidence presented. However, the reservoir area did not change.

The marketable product of a hydropower plant in Brazil is the assured energy. Usually, this marketable energy is lower than the full-assured energy due to energy losses on the connection and transmissions

[3] http://www.aneel.gov.br

[4] It was used the profile of the Brazilian Electrical Sector of the "Atlas of Electric Energy of Brazil,3rd edition ", year 2008 (ISBN: 978-85-87491-10-7) elaborated by National Agency of Electric Energy in November 2008 – pages 159to 233.

system, besides internal consumption. The assured energy is formally calculated and established for commercial purposes by the regulators (ANEEL and MME – Ministry of Mines and Energy). MONEL does not have control over decisions about changes of any kind and is not sure about possible changes in assured energy, for this being a governmental decision.

TABLE A.3 presents the main technical parameters of HPP Alzir dos Santos Antunes.

TABLE A.3: *Technical parameters of HPP Alzir dos Santos Antunes.*

1. **DAM**	
TYPE: Rockfill with Concrete Face LENGTH ALONG CREST: 420 m MAXIMUM HEIGHT: 74 m ELEVATION OF CREST: 335 m	ROCKFILL: 1,284,589 m³ FILTER AND TRANSITION 55,850 m³ CONCRETE (CONVENTIONAL): 11,632 m³ TOTAL VOLUME: 1,378,253 m³
2. **SPILLWAY**	
TYPE: SURFACE WITH OVERFLOW CREST CAPACITY: 6,755 m³/s LEVEL SURFACE: 328,50 m TOTAL LENGHT: 210 m NUMBER OF GATE: 1	GATE'S WIDTH: 210 m COMMOM EXCAVATION: 96,755 m³ ROCK EXCAVATION ON OPEN SKY: 880,078 m³ CONCRETE (CONVENTIONAL): 6,955 m
3. **ADUCTOR SYSTEM**	
APPROACH CHANNEL LENGTH: 155m COMMOM EXCAVATION 18,300 m³ ROCK EXCAVATION ON OPEN SKY: 80,800 m³	**WATER INTAKE** TYPE: GRAVITY TOTAL LENGHT: 25 m NUMBER OF GATES: 2 COMMOM EXCAVATION: 7,700 m³ ROCK EXCAVATION ON OPEN SKY: 27,200m³ CONCRETE: 4,622m³
TUNNEL INTERNAL DIAMETER: 4.20/3.60 m MEDIUM LENGHT: 111 m CONCRETE: 2,596 m³ UNDERGROUND ROCK EXCAVATION: 6,890 m³	**FLOODGATES** TYPE: WAGON MEDIUM LENGHT: 111.00 m TO SET IN MOTION: HIDRAULIC GATE'S WIDTH 4.20 m GATE'S HEIGHT: 4.00 m
4. **POWER HOUSE**	
TYPE: SHELTERED NUMBER OF GENERATORS UNITS: 2 WIDTH OF BLOCK OF UNIT: 14 m WIDTH OF MOUNTING AREA: 25 m WIDTH OF UNLOADING AREA: 8.15 m TOTAL LENGHT: 68.00 m	COMMOM EXCAVATION: 54,830 m³ ROCK EXCAVATION ON OPEN SKY: 107,84 m³ CONCRETE: 8,260 m³
5. **TURBINES**	
TYPE: FRANCIS NOMINAL UNIT FLOW: 69.50 m³/s NOMINAL UNIT POWER: 37.75 MW	MAXIMUM PERFOMANCE: 95 % SYNCHRONOUS ROTATION : 257.14 rpm
6. **GENERATORS**	
NOMINAL UNIT POWER: 41.11 MVA SYNCHRONOUS ROTATION: 257.11 rpm NOMINAL TENSION: 13.8kV	MAXIMUM PERFOMANCE: 98% CAPACITY FACTOR: 0.90
7. **POWER STUDIES**	
MAXIMUM GROSS FALL: 65.30 m ASSURED ENERGY: 43.80 MWavg	MEDIUM NET FALL REFERENCE: 61.00 m POWER PLANT CAPACITY: 74.00 MW

There are four (4) meters of electricity in the HPP Alzir dos Santos Antunes. Two of them are located in each generator unit. They measure the gross electricity generated by each generator unit. The other two meters (one principal and one rearguard) are located in the substation "Passo Fundo". They measure the net electricity supplied to the grid.

The equipment and technology employed in the project were developed in Brazil and have already been successfully applied to similar projects in the country and in the world. The technology applied is well established in the sector, since the Francis turbine is one of the most widely used in hydropower plants projects in the world. A national company is responsible for the entrepreneurship's implementation, since Engevix was hired by MONEL to the project's complete execution through the EPC (Engineering, Procurement and Construction) modality, being responsible for the whole project elaboration, from feasibility studies to construction, electromechanical assembly, works on reservoirs and emergency action plans.

The greenhouse gas (GHG) involved in the project activity is CO_2, which emissions will be reduced by the replacement of electricity generation in fossil fuel fired plants by a renewable energy plant. No project nor leakage emissions were considered, according to the methodology's assumptions, as demonstrated in Section E of this document.

A7. *EX ANTE* OFFSET PROJECTION

Estimated GHG reductions by year are presented in TABLE A.4.

***TABLE A.4**: Ex-ante Estimations of HPP Alzir dos Santos Antunes Project.*

Year	Project activity emissions (tCO_2e)	Baseline emissions (tCO_2e)	Leakage (tCO_2e)	Overall emission reductions (tCO_2e)
2009 (Sep - Dec)	0	15,994	0	15,994
2010	0	115,872	0	115,872
2011	0	74,646	0	74,646
2012	0	134,561	0	134,561
2013	0	160,962	0	160,962
2014	0	106,938	0	106,938
2015	0	106,938	0	106,938
2016 (Jan - Aug)	0	71,780	0	71,780
Total (tCO_2e)	**0**	**787,692**	**0**	**787,692**
Annual Average (tCO_2e)	**0**	**112,527**	**0**	**112,527**

A8. PARTIES

Project Participants:

1) MONEL – Monjolinho Energética S/A and DESENVIX Energias Renováveis S/A

Description: MONEL – Monjolinho Energética S/A is a company with headquarters in Barueri, São Paulo State, Brazil, owned by DESENVIX Energias Renováveis S/A, which holds a significant renewable energy portfolio as presented in the sections above.

Responsibilities: HPP Alzir dos Santos Antunes project is owned by MONEL. However, once DESENVIX holds 100% of MONEL's shares, DESENVIX will be selected as project proponent and will be the company opening the account on ACR system. MONEL is the owner of all the land where the project is installed and responsible for all the activities regarding the project maintenance and control, while DESENVIX will hold offset title.

Contact information:

DESENVIX ENERGIAS RENOVÁVEIS S/A

Contact: Mr, Maurício César Costa (Project Manager)

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Homepage: www.desenvix.com.br

2) Embrasca Environmental Consulting

Description: EMBRASCA is an environmental consulting company located in the Midwest of Brazil that has been specializing itself in the services business, which major themes are the implementation of social and environmental responsibility programs (directed to enterprises and other institutions), environmental monitoring (regarding activities with a great impact, such as construction) eand environmental marketing, by guiding its clients into appropriate communications methods in the environmental scenario. Since 2002, Embrasca has chosen to work in a specialized way in the carbon market business, due to the imminent preoccupation associated with the climate change.

Responsibilities: EMBRASCA will cover all the GHG Project activities, from developing the GHG Project Plan and coordinating the steps to registration, validation, verification and certification, monitoring and communication with ACR staff.

Contact information:

EMBRASCA – Empresa Brasileira de Serviços e Consultoria Ambiental Ltda

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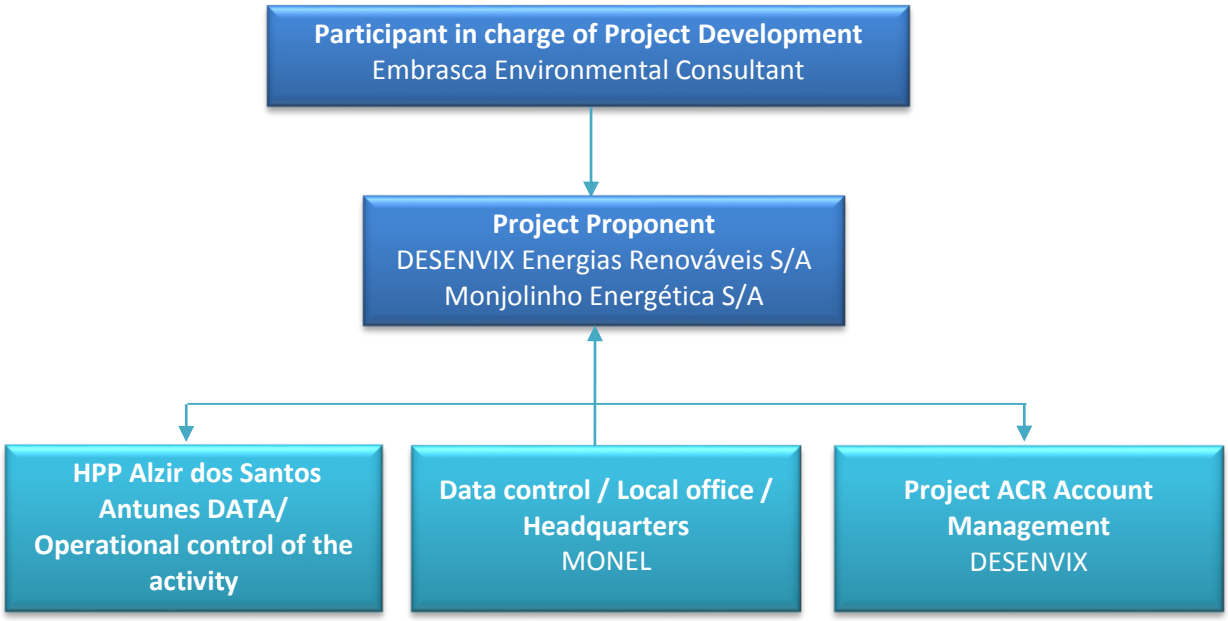

Participant in charge of Project Development
Embrasca Environmental Consultant
Project Proponent
DESENVIX Energias Renováveis S/A
Monjolinho Energética S/A
HPP Alzir dos Santos Antunes DATA/ Operational control of the activity
Data control / Local office / Headquarters
MONEL
Project ACR Account Management
DESENVIX

B.
METHODOLOGY

B1. APPROVED METHODOLOGY

According to ACR Standard v.3.0, ACR requires every project submitted for registration to use an ACR-published or ACR approved methodology, The ACR approved methodology used in this project is CDM **ACM0002, v.15.0 (EB 79): "Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources"**.

This CDM approved methodology is supported by the also CDM tools:

- "Combined tool to identify the baseline scenario and demonstrate additionality", v.05.0.0;
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", v.02;
- "Tool to calculate the emission factor for an electricity system", v.04.0 and;
- "Tool for the demonstration and assessment of additionality", v.07.0.0.
- "Guidelines on the assessment of investment analysis" (EB 62, Annex 5, Page 1);

B2. METHODOLOGY JUSTIFICATION

The methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity; (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s), HPP Alzir dos Santos Antunes Project is under activity (a) and, therefore, is justified.

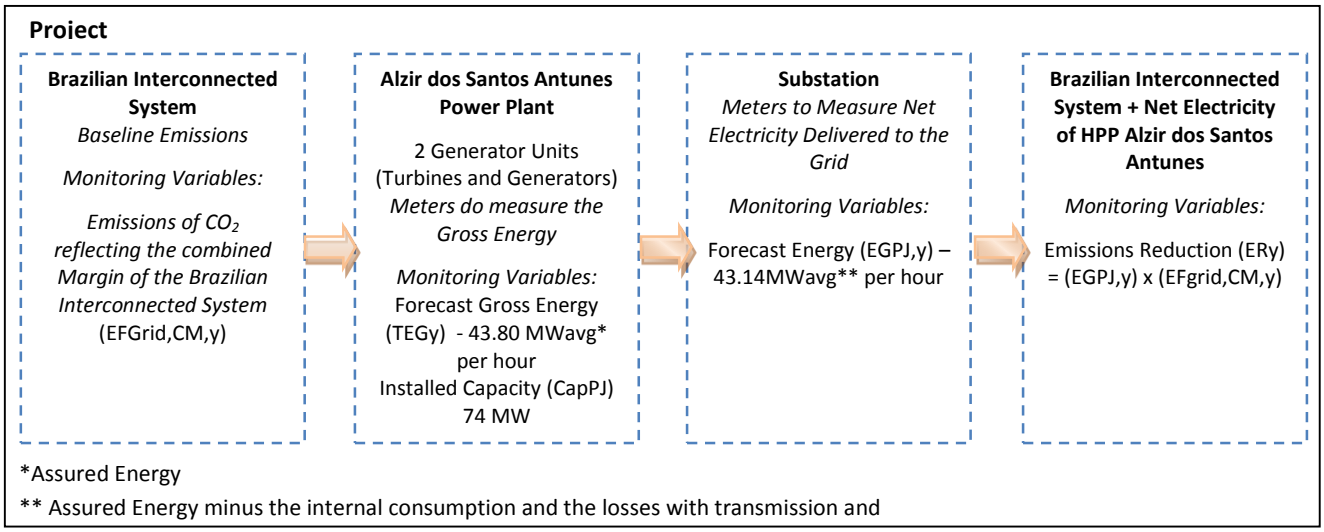
B3. PROJECT BOUNDARIES

According to ACM0002, version 15.0, the spatial extension of the project boundary includes "*the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to*." The HPP Alzir dos Santos Antunes is connected to the National Interconnected System.

The National Interconnected System (from Portuguese, Sistema Interligado Nacional - SIN) is managed by ONS, which is responsible for all activities related to the operation's planning. The ONS traditionally subdivides the National Interconnected System into two subsystems interconnected: the South/ Southeast/Midwest Subsystem and the North/Northeast Subsystem, These Subsystems are related to the Brazilian geographic regions: South, Southeast, Midwest, North and the Northeast Region.

Due to the offer's real availability and the consumption behavior in each region, ONS establishes interregional energy exchange politics, besides exceptional attitudes to thermal generation dispatch, in case the storage levels of water significantly reduce and tend to violate the security curves. These conditions are permanently monitored and available to the electric industry agents.

The flow diagram of the project boundary is presented below.



*Assured Energy

** Assured Energy minus the internal consumption and the losses with transmission and

B4. IDENTIFICATION OF GHG SOURCES AND SINKS

The GHG sources and sinks considered in the project boundary are presented in TABLE B.1.

TABLE B.1: *Emissions sources included in or excluded from the project boundary.*

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Included	Main Emission Source In the absence of the project, coal thermoelectric plants in the National Interconnected System would cause GHG emissions
		CH_4	Excluded	Minor Emission
		N_2O	Excluded	Minor Emission Source
Project Activity	For hydropower plants, emissions of CH_4 from the reservoir	CO_2	Excluded	HPP Alzir dos Santos Antunes's power density is greater than 10W/m², so the emissions from the project activity are zero (PEy=0)
		CH_4	Excluded	
		N_2O	Excluded	

B5. BASELINE

According to CDM approved methodology ACM0002, v.15.0, regarding the identification of the baseline scenario, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> *"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".*

The combined margin emission factor of National Interconnected System will be calculated, according to the "Tool to calculate the emission factor for an electricity system, v.4.0.0" approved by the CDM Executive Board. The CO_2 emission factors from power generation in the National Interconnected System are calculated based on the generation records of plants centrally dispatched by the National Operator of the System (from the Portuguese: Operador Nacional do Sistema - ONS). The combined margin emission factor of the National Interconnected System will be applied in baseline emissions calculations.

This baseline is perfectly applicable to HPP Alzir dos Santos Antunes.

As an additional information, it can be noticed, through the projection established by the Ministry of Mines and Energy (MME) in the Decennial Plan of Electrical Energy Expansion to the period of 2006-2015, that other activities and technologies that propitiate a higher emission of greenhouse gases would occur in the absence of these project.

Brazilian Decennial Plan for Electric Energy Expansion (2006-2015)

In 2006, the Ministry of Mines and Energy elaborated the Decennial Plan for Electric Energy Expansion[5] to the period of 2006-2015, establishing three possible scenarios, based on the growth projection of the country's Gross Domestic Product (GDP). We adopted to this analysis the scenario pointed out by the MME as the most likely to happen, called reference scenario. This reference scenario estimates the necessity of expansion of the Brazilian electrical sector.

Considering MME's projection, it was traced a plan for the generation expansion based on the energetic offer from the implantation of entrepreneurships of hydroelectric and thermoelectric generation. It was estimated a necessity of growth in the energetic offer which points to an additional energy's offer from thermoelectric entrepreneurships that will result on a volume of 10,486 MW in 2006-2015 period.

It is important to highlight that from the additional offer of 10,486 MW coming from thermoelectric Plants, the projection indicates that 1,769 MW will be generated from the entrepreneurships that will dispatch energy to SIN in the South Region of Brazil. The thermoelectric plants projected to start their operation through the South Region in the period of 2006-2015 are described on TABLE B.2.

TABLE B.2: *Thermoelectric Power Plants to be developed in the Brazilian South Region predicted in the Decennial Plan for the Expansion of the Electrical Sector.*

Power Plant	Capacity (MW)	Fuel	Start of Operation
Canoas	250	Natural Gas	January/08
Araucária	469	Natural Gás	December/08
Jacuí	350	Mineral Coal	December/08
Candiota III	350	Mineral Coal	December/08
Carvão Indic, S	350	Mineral Coal	December/09
Total	**1,769**		

It is also important to highlight that at the time of the project implementation there were seven thermoelectric plants in Brazil, operating with mineral coal, totalizing an installed capacity of 1,415 MW, according TABLE B.3.

[5] Source: Ministério de Minas e Energia (MME) - Plano Decenal de Expansão de Energia Elétrica, 2006-2015.

Table B.3: Thermoelectric Power Plants in Operation in Brazil at the time of the project implementation,

Power Plant	Capacity (MW)	State
Figueira	20	Paraná
Charqueadas	72	Rio Grande do Sul
Pres. Médici A, B	446	Rio Grande do Sul
São Jerônimo	20	Rio Grande do Sul
Jorge Lacerda I e II	232	Santa Catarina
Jorge Lacerda III	262	Santa Catarina
Jorge Lacerda IV	363	Santa Catarina
Total	**1,415**	

All the thermo electrical entrepreneurships that generate energy from mineral coal burning in the country are situated in the South Region, where HPP Alzir dos Santos Antunes is located.

The Energetic Expansion Plan to the period of 2006-2015 predicts a growth of approximately 74% in the offer of electrical energy based on mineral coal in the country, all the projects being located in the South region, connected to the National Interconnected System.

It is reasonable to consider that the electric energy generation of HPP Alzir dos Santos Antunes can avoid the thermo electrical entrepreneurships that generate energy from the burning of mineral coal, whether they are new or existent, from being activated.

B6. PROJECT SCENARIO

The project scenario consists of the implementation of the hydropower plant with a 74 MW installed capacity. The project started on September, 1, 2009, with the start of activity of the first turbine, but the established start date is September 3, 2009, when both turbines were running.

Emissions related to the project, as per approved methodology ACM0002, v.15.0, for hydropower plants, consist of CH_4 emissions from the reservoir. Those emissions should be accounted only if the power density of the single or multiple reservoir is greater than 4/m² and less than or equal to 10W/m².

The power density consists on the relation between the installed capacity and the reservoir area, as will be showed in Section E – Quantification. Since HPP Alzir dos Santos Antunes power density is greater than 10 W/m² no project emissions were considered.

B7. REDUCTIONS AND ENHANCED REMOVALS

At the baseline scenario, there would not be GHG reductions or removals from the atmosphere. The fossil fuel fired plants action would result in GHG emissions to the atmosphere.

The project reduces GHG emissions by avoiding those fossil fuels emissions with the implementation of one renewable energy power plants, based on hydropower generation, with no emissions related to the project activity nor leakage.

In the seven year crediting period, it is estimated at 787,692tCO_2e the emissions reductions.

B8. PERMANENCE

The project offsets do not face any risk of reversal because the emissions reductions will occurs at the electricity generation moment and cannot be reversed. For this reason, there is no need of applying a method of permanence assurance.

C.
ADDITIONALITY

ACR requires (ACR Standard, v.3.0) that every project should either pass an approved performance standard and a regulatory additionality test, or pass a three-pronged test to demonstrate that the Project Activity is: (i) beyond regulatory requirements; (ii) beyond common practice and; (iii) faces at least one of three implementation barriers (financial, technological or institutional). The three-pronged test option was chosen.

C1. REGULTORY SURPLUS TEST

The project activity is in accordance to the applicable Brazilian laws and regulations. As mentioned before, the project is located in the South Region of Brazil, known for the presence of thermoelectric mineral coal plants, Particularly, approximately 38% of thermoelectric coal plants of the country are located in Rio Grande do Sul State. Moreover, according to Brazil's Atlas of Electric Energy, 90% of the national reserves of mineral coal are concentrated in Rio Grande do Sul, where the project is located.

It is important to clarify that the Brazilian Institutional New Model of the Electric Sector allows the private and public agents to decide the amount of energy to be hired and the investments to be realized from the participation in auctions of power plants and systems of transmission.

According to the Ministry of Mines and Energy, *"the agents of distribution decide and compromise themselves to pay, through contracts resulting from auctions, amounts of electrical energy coming from new installations of electric energy generation to be delivered (…). With the distributors' information, the generators may then decide which new entrepreneurships of generation they wish to build, presenting in the auctions proposals of selling prices of their electric energy, competing for contracts of energy purchase from distributors. Additionally, the generators may also hire direct and freely with free consumers".*

Moreover, there is no Brazilian legislation, in any level (Federal, State or Municipal) forcing the realization of renewable energy projects or energy projects of any kind.

This way, it can be noticed that there are no restrictions in the applicable laws and regulations to the implantation of the alternative scenarios to CDM's activity project. It is further noticeable that the Brazilian Institutional New Model of the Electric Sector provides autonomy to the economic agents about the investments to be realized in the Brazilian electric sector, not existing, therefore, restrictions nor impositions to the project activity.

Test Result: The project activity is not mandatory by any Brazilian Legislation and, therefore, the criterion is satisfied.

C2. COMMON PRACTICE TEST

Common practice analysis was carried out according to the following documents:

- ACR Standard v.3.0;
- CDM approved CDM "Tool for the demonstration and assessment of additionality, v.7.0.0" (EB 70, Annex 08, Page 1);
- CDM Guidelines on Common Practice, v. 02.0 (EB 69, Annex 8).

According to the latest version of ACR Standard (v.3.0), "*the common practice test requires the Project Proponent to evaluate the predominant technologies or practices in use in a particular industry, sector, and/or geographic region, as determined by the degree to which those technologies or practices have penetrated the market, and demonstrate that the proposed project activity is not common practice and will reduce GHG emissions below levels produced by common technologies or practices within a comparable environment (e.g. Geographic area, regulatory framework, investment climate, access to technology financing, etc.).*

The common practice test was carried out considering the following statements, in accordance with the latest version of CDM Guidelines on Common Practice:

- **Applicable geographical area:** Brazil South Region.[6]
- **Measure:** Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies – in this case, hydropower.
- **Output:** service produced by the project activity: electricity.

The stepwise approach suggested on the CDM Guidelines on Common Practice was followed:

STEP 1: Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

The projects to be considered in the analysis must have installed power between 37 MW (50% below the HPP Alzir dos Santos Antunes) and 111 MW (50% above of HPP Alzir dos Santos Antunes installed capacity which is 74 MW).

STEP 2: Identify similar projects (both CDM and non-CDM) which fulfil ALL of the following conditions:

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas as the proposed project plant;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(f) The projects started commercial operation before the start date of proposed project activity, whichever is earlier for the proposed project activity.

[6] According to ANEEL, 2008 (Atlas da Energia Elétrica do Brasil, 3ª edição, 2009): "Of all segments of the infrastructure, electricity is the most universalized service. The incidence and dimensions of unserved niches are directly related to its location - and the physical or economic hardship extension to the power grid. After all, each of the five geographical regions that divide Brazil - South, Southeast, Midwest, Northeast and North - has quite peculiar and different from other features. These characteristics determine the contours of the systems for generation, transmission and distribution have acquired over time and still determine the greater or lesser ease of access for the local population to the grid"(Chapter 1, page 6).

A research in ANEEL online database[7] was conducted in order to determine what are the similar projects existing in Southern Brazil before 2009 (year of the HPP Alzir dos Santos Antunes implementation). The identified plants (hydroelectric) are presented as follows (Table C.1):

Table C.1: *Projects identified in Step 2 of Common Practice.*

ENTREPRENEURSHIP	CAPACITY (MW)	STATE
HPP OURINHOS	44	PR
HPP CANASTRA	44.8	RS
HPP CANOAS II	72	PR
HPP SALTO GRANDE (LUCAS NOGUEIRA GARCEZ)	73.8	PR
HPP 14 DE JULHO	100	RS

STEP 3: Within the projects identified in STEP 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

Of the five projects presented in Table C.1, one consists of a CDM project activities (Table C.2). Therefore, **N_{all} = 4.**

Table C.2: *Projects within the range that are CDM projects.*

REGISTERED	ENTREPRENEURSHIP	TITLE	METHODOLOGY	REDUCTIONS (tCO_2e)
Apr 09, 09	14 de Julho	Ceran's 14 de Julho Hydro Power Plant CDM Project Activity[8]	ACM0002 ver. 6	245,493

STEP 4: Within similar projects identified in STEP 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

For purposes of the differentiation of the plants, further explanation is presented as follows:

In spite of the existence of projects similar to HPP Alzir dos Santos Antunes project activity in operation in the Southern region of the country; it is necessary to establish peculiar characteristics of these entrepreneurships that do not allow them to be configured as a common business scenario in the country.

The use of hydraulic potentials in Brazil to the generation of electric energy has historically demanded the formation of great reservoirs and inundation of big-flooded areas. These constructions have used, in the majority of the cases, water accumulation reservoirs and regulations of water flow that provoked alteration in the regimen of water and the formation of microclimates, favoring, damaging or even extinguishing certain species.

Other fact that must be highlighted is that, analyzing the history of Brazilian electrical sector, it is verified that in the past the country's legislation did not incorporate the environmental variable in national electric sector planning. However, facing the undesirable social-environmental impacts resulting from the implantation of hydroelectric entrepreneurships, a series of legal demands that aim at avoiding and

[7] http://www.aneel.gov.br/aplicacoes/capacidadebrasil/energiaassegurada.asp
[8] http://cdm.unfccc.int/Projects/DB/SGS-UKL1209121131.35/view

mitigating the environmental effects of this kind of project have become demands of the conceding power and of the legislative organs. With this, for the implementation of new hydro projects in Brazil there is a tremendous increase on investments regarding environmental and social issues, where in some cases become so higher that the financial attractiveness of new entrepreneurships can be seriously affected, also become not viable the implementation.

HPP Alzir dos Santos Antunes is an entrepreneurship that has 74 MW of installed capacity and 43.8 MW of assured energy, being different, therefore, of the great national hydro electrical sites and not having the enormous potential for revenues of this kind of entrepreneurship. Moreover, HPP Alzir dos Santos Antunes is a run-of-the-river power plant that has a power density of 13.55 MW/km², with a flooded area of 5.46 km², what indicates low environmental impacts. It also considers in its planning a series of investments in programs and environmental actions that did not exist when there was the implantation of the greatest part of hydroelectric power plants in the Southern Region. This way, the implantation of this project does not count on large revenues from the great Brazilian hydroelectric entrepreneurships and has minimal environmental impacts that demand investment, for these characteristics, its cash flow presents return rates below the markets references, and the revenue from selling certified emission reduction becomes important to make the project possible.

It is important to highlight that the great majority of hydropower projects that were not developed by State-owned companies were developed by consortium of several companies that shared the project risks, HPP Alzir dos Santos Antunes is being developed by one company alone – MONEL, which assumes all the project's risks and investments.

For this reason, the criteria selected to select the entrepreneurships that differ from HPP Alzir dos Santos Antunes is the investment type. Therefore, the projects which are similar to the project proponent are the ones private and single-owned, that not compose a Consortium or are State-Owned.

Considering the plants presented in Table C.2, there are four plants in the analysis, furtherly described below:

- HPP OURINHOS[9]: The hydropower plant of Ourinhos is located in the border of São Paulo and Paraná States, in Rio Parapanema River, between the municipalities of Ourinhos and Jacarézinho. It started its operations in 2005 and it has three generation unities, with 44.1 MW of installed capacity. It is sinlge-owned by the Brazilian Aluminum Company (from Portuguese, *Companhia Brasileira de Alumínio* – CBA).
- HPP CANASTRA: The hydropower plant Canastra is located at the source of Santa Maria River, in the municipalities of Canela, Rio Grande do Sul State. It represents the river's main flow, resultant from the diversion of the Santa Cruz River for the Hydropower Plant Bugres. It started its operation in 1956 and it is a State-owned entrepreneurship. The plant's management is carried out by the State Electricity Transmission and Generation Company (from Portuguese, *Companhia Estadual de Geração e Transmissão de Energia Elétrica - CEEE*). Because of its age, the plant is placed in the context of the Old Energy Model.

[9] http://www.ons.org.br/resultados_operacao/boletim_semanal/2005_12_09/instalacoes.htm

- HPP CANOAS II[10]: The hydropower plant Canoas II is located at Rio Parapanema River, which divides the States of São Paulo (Southeast) and Paraná (South). The construction began in 1992 and it was concluded in 1999. The plant has three bulb-type turbines, which generate up to 72MW, from a height of 14.5 m. It has a 22.5 km² reservoir area. The plant is private-owned, by a Consortium between Duke Energy and CBA[11].
- HPP SALTO GRANDE[12]: The hydropower plant Salto Grande (current name Lucas Nogueira Garcez) started its operations in 1958. It is located at Parapanema River, between Salto Grande (São Paulo State – Southeast) and Cambará (Paraná State – South) cities. It operates with four Kaplan-type turbines and a 74MW full capacity. The reservoir area is 12 km² and it is considered a run-of-the-river plant. The plant is private-owned, by Duke Energy.

From the four hydropower entrepreneurships presented, two are considered similar to HPP Alzir dos Santos Antunes, because they are also private and single-owned: HPP Ourinhos and HPP Salto Grande.

Therefore, there are three different plants: HPP Canastra and HPP Canoas II. For this reason, $\mathbf{N_{diff} = 2.}$

STEP 5: calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$$N_{all} = 4 \text{ and } N_{diff} = 2$$
$$F = 1-(2/4)$$
$$\mathbf{F = 0.5}$$

$$N_{all} - N_{diff} = 4 - 2$$
$$\mathbf{N_{all} - N_{diff} = 2}$$

TEST: The proposed project activity is "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and Nall-Ndii is greater than 3.

Test results discussion:

Considering HPP Alzir dos Santos Antunes tests results were F=0.5 and N_{all}-N_{diff} = 2, we confirm that the project is not common practice, because one of the results is in accordance with the CDM Guidelines rules (Nall-Ndiff = 2.)

Test result: project is not common practice in the selected region.

[10] ABC da Energia, Duke Energy. Available for consultation and also available at: http://www.duke-energy.com.br/Style%20Library/Images/Duke/Home/ABC%20da%20Energia_FINAL_2MB.pdf

[11] As described in *2011 Duke Energy Report.pdf*

[12] ABC da Energia, Duke Energy. Available for consultation and also available at: http://www.duke-energy.com.br/Style%20Library/Images/Duke/Home/ABC%20da%20Energia_FINAL_2MB.pdf

C3. IMPLEMENTATION BARRIERS TEST

ACR requires that the project pass at least one of the barriers: financial, institutional or technological. Energy generation projects are usually additional by proving financial improvement when considering the offsets sales.

The investment analysis was carried out using the following CDM guidelines and tools:

- "Guidelines on the assessment of investment analysis" (EB 62, Annex 5, Page 1);
- "Tool for the demonstration and assessment of additionality, v.7.0.0" (EB 70, Annex 08, Page 1).

The analysis should determine whether the proposed project activity is not:

(a) The most economically attractive; or
(b) Economically or financially feasible, without the revenue from the sale of emission reductions tons (ERTs);
To conduct the investment analysis, certain steps should be followed:

Sub-step 2a - Determine appropriate analysis method

The project generates financial and economic benefits, other than the offsets related income, then, the benchmark analysis will be carried on to evaluate the project activity (Option III).

Sub-step 2b – Option III, Apply benchmark analysis

The financial indicator chosen for this project assessment was the Internal Rate of Return (IRR), due to its overall use in infrastructure projects' investment analysis. To determine the benchmark, the Weighted Average Capital Cost (WACC) of the project was applied.

WACC (Weighted Average Capital Cost)

he Weighted Average Capital Cost is calculated through the composition of costs and the participation percentage of each source of capital in the company's capital structure. HPP Alzir dos Santos Antunes project WACC was calculated according to the following equation:

$$WACC = \frac{E}{V}\ x\ Re + \frac{D}{V}\ x\ Rd\ x\ (1 - Tc) \qquad \textit{(Equation 1)}$$

Where:

E/V = percentage of equity in company's capital structure;

Re = cost of equity;

D/V = percentage of debt in company's capital structure;

Rd = cost of debt;

Tc = income tax in Brazil.

CAPM (Capital Assets Price Model) was used to calculate cost of equity, according to the following equation:

$$Re = R_f + \beta_i(ERP) \qquad \textit{(Equation 2)}$$

Where:

Re = cost of equity;

Rf = rate of return of a risk free asset;

βi = beta coefficient;

ERP = equity risk premium.

To calculate the cost of debt the entrepreneurship cost of lending was used.

Sub-step 2c – Calculation and comparison of financial indicators

Monjolinho Energética S.A, considers the project's cash flow a confidential information and, thus, it will be presented entirely to the Designated Operation Entity which will perform the validation and to any entity linked to ACR that ask for it for the purpose of proving the project's additionality. However, it will not be available in this GHG Project Plan. The period of assessment in the context of the underlying project activity is of 35 years as determined by its Concession Term presented in the second clause of the Concession Contract established with ANEEL (National Electric Energy Agency).

Since the project is already in operation since the beginning of September, 2009, is was required that this document presents financial information from all four years to be verified in 2014 (from 2009 to 2013). The original feasibility analysis is presented, according to data on TABLE C.2 and calculations are available on spreadsheet attached named "Appendix2InvestmentAnalysis.xls". Data from the project years in operation (TABLE C.3) were used to complete the Sensibility Analysis, updating O&M values, as further explained when necessary.

TABLE C.2: *Assumptions used for HPP Alzir dos Santos Antunes Project cash flow.*

Concession Term	35 years
Energetic Characteristics	
Installed capacity	74 MW
Assured energy	43.80 MWavg
Internal Losses	1.40%
Energy in transmission/distribution connection point (without transmission losses)	43.19 MWavg
Marketable energy (MWh, considering losses)	42.58 MW
Power Purchase Agreements	
Selling price	R$ 122.63/MWh
Operational Expenses and Sectorial Taxes	
O&M	R$ 125 thousand/month + R$ 150 thousand/year (estimated)
Use of the Public Asset (UBP in Portuguese)	R$ 3,901,843 per year
Financial compensation	R$ 57.63/MWh on 6.75% of the assured energy
Supervisory tax ANEEL	R$ 289.22/kW over 0.5% of the installed capacity per year
TUSD RGE	R$ 2.98/kw per month

CCEE tax	25% TFSEE
ONS tax	25% TFSEE
Research and development	1% over Net Operational Revenue
Assets insurance	0.4% per year over the invested value
Lending	
Cost of debt	TJLP + 2.10 %
Grace Period	6 months
Amortization	16 years
Amortization System	SAC
Capital Structure	
Equity	R$ 81,715,112
Debt	R$ 199,255,688
Total Capital	R$ 280,970,800
Depreciation	
ANEEL	35%
Federal Revenue	20%

TABLE C.3: *Current cash flow values for the four first years of project operation.*

Year 2009	
O&M	R$ 746 thousands per year
Use of the Public Asset (UBP in Portuguese)	R$ 1,640 thousands per year
Financial compensation (CFURH)	R$ 797 thousands per year
Supervisory tax ANEEL	R$ 0 per year
TUSD RGE	R$ 1,078 thousands per year
CCEE tax	R$ 5 thousand per year
ONS tax	R$ 3,68 thousand per year
Research and development	R$ 236 thousand per year
Assets insurance	R$ 156 thousand per year
Year 2010	
O&M	R$ 1,940 thousands per year
Use of the Public Asset (UBP in Portuguese)	R$ 5,005 thousands per year
Financial compensation (CFURH)	R$ 1,626 thousands per year
Supervisory tax ANEEL	R$ 215 thousands per year
TUSD RGE	R$ 3,090 thousands per year
CCEE tax	R$ 24 thousand per year
ONS tax	R$ 11 thousand per year
Research and development	R$ 807 thousand per year
Assets insurance	R$ 272 thousand per year
Year 2011	
O&M	R$ 1,950 thousands per year
Use of the Public Asset (UBP in Portuguese)	R$ 5,368 thousands per year

Financial compensation (CFURH)	R$ 2,135 thousands per year
Supervisory tax ANEEL	R$ 143 thousands per year
TUSD RGE	R$ 2,883 thousands per year
CCEE tax	R$ 40 thousand per year
ONS tax	R$ 11 thousand per year
Research and development	R$ 572 thousand per year
Assets insurance	R$ 281 thousand per year
Year 2012	
O&M	R$ 2,046 thousands per year
Use of the Public Asset (UBP in Portuguese)	R$ 5,794 thousands per year
Financial compensation (CFURH)	R$ 1,424 thousands per year
Supervisory tax ANEEL	R$ 154 thousands per year
TUSD RGE	R$ 2,900 thousands per year
CCEE tax	R$ 36 thousand per year
ONS tax	R$ 10 thousand per year
Research and development	R$ 617 thousand per year
Assets insurance	R$ 275 thousand per year
Year 2013	
O&M	R$ 2,210 thousands per year
Use of the Public Asset (UBP in Portuguese)	R$ 6,182 thousands per year
Financial compensation (CFURH)	R$ 2,135 thousands per year
Supervisory tax ANEEL	R$ 143 thousands per year
TUSD RGE	R$ 2,042 thousands per year
CCEE tax	R$ 48 thousand per year
ONS tax	R$ 10 thousand per year
Research and development	R$ 642 thousand per year
Assets insurance	R$ 256 thousand per year
2014 and thereafter	
O&M	R$ 1,507 thousands per year
Use of the Public Asset (UBP in Portuguese)	R$ 8,876 thousands per year
Financial compensation (CFURH)	R$ 1,980 thousands per year
Supervisory tax ANEEL	R$ 155 thousands per year
TUSD RGE	R$ 2,343 thousands per year
CCEE tax	R$ 48 thousand per year
ONS tax	R$ 24 thousand per year
Research and development	R$ 674 thousand per year
Assets insurance	R$ 258 thousand per year

The project internal rate of return resulting from the cash flow elaborated according to assumptions above is 8.62% per year.

To calculate the weighted average capital cost was used the following assumptions:

Cost of Equity:

To calculate the cost of equity Equation 2 was applied, using the following parameters:

- Re = Cost of Equity;
- R*f* = Rate of Return of U.S. Treasuries (T-Bond) of 30 years[13] + Median of Brazilian Risk between 2001 and 2006[14]+ Average of Adjustment between U.S[15] Inflation and Brazilian Inflation[16] of the years 2004,2005 and 2006;
- β*i* = Project Beta, To calculate the Project Beta, some steps were followed:
    - 1) Obtaining the Levered Beta between the Electric Energy Index (IEE)[17] and the Bovespa Index (Índice Ibovespa)[18] for the period of august/2002 to July/2007;
    - 2) Levering Beta according the average capital structure of the companies that compose the IEE[19];
    - 3) The Unlevered Beta was levered again according to the capital structure of the project. This Levered Beta was used for calculation of HPP Alzir dos Santos Antunes project cost of equity.
- ERP = Equity Risk Premium in Brazil, calculated by Aswath Damodara[20] according to data of Standard & Poors.

TABLE C.4 presents the values used to cost of equity's calculation.

TABLE C.4: *Parameters used to cost of equity's calculation.*

Parameters	HPP Alzir dos Santos Antunes
Rf – Rate of Return of a Risk Free Asset	10.93%
Rate of Return of U,S Treasuries	4.38%
Median of Brazilian Risk	4.23%
Adjustment of Inflation	2.33%

[13] Source: http://www.bloomberg.com/markets/rates/index.html

[14] Calculated Through the Average of the Index Índice EMBI + Brasil, available at: http://www.cbonds.info/index/search.php

[15] To measure the American Inflation the Index CPI – U. Available at: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt

[16] To measure the Brazilian Inflation the Index IPCA was used. Available at: http://pt.wikipedia.org/wiki/Infla%C3%A7%C3%A3o#Hist.C3.B3rico_do_Quadro_Inflacion.C3.A1rio_no_Brasil

[17] The Electric Energy Index is composed by the stocks of the most representatives companies in the electric industry in the São Paulo Stock Exchange. Source of Data: São Paulo Stock Exchange. Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaAnuaisFechDia.asp?Indice=IEE

[18] Index calculated by São Paulo Stock Exchange which reflects the average performance of the prices in Brazilian Stock Market. The stocks members of the theoretical portfolio answer for more than 80% of the number of business and of the financial volume negotiated in the spot market of São Paulo Stock Exchange.. Source: Bloomberg

[19] Data source of companies that compose IEE and their capital structure was São Paulo Exchange. Available at: http://www.bovespa.com.br/Mercado/RendaVariavel/Indices/FormConsultaCarteiraP.asp?Indice=IEE

[20] Available at http://pages.stern.nyu.edu/~adamodar/

Project Beta	**1.67**
Levered Beta (IEE – BOVESPA)	0.93
Unlevered Beta	0.62
Equity Risk Premium	**7.79%**
CAPM	**23.94%**

Therefore, the cost of equity is 23.94% per year.

Cost of Debt

The cost of debt is based on the cost of lending's contract. HPP Alzir dos Santos Antunes project funding was signed with BNDES according to conditions described on Table 9. For financial and economic modeling effects, TJLP (Interest Tax of Long Term) was considered uniform during all lending period, with a value of 6.25% per year, The cost of debt is formed, thus, by TJLP plus 2.1% per year as banking spread, constituting a total cost of 8.35% per year.

Weighted Average Capital Cost (WACC)

The project's capital structure is composed by 29.08% of equity and 70.92% of debt, as described on Table 9. This way, considering a cost of equity of 23.94%, a cost of debt of 8.25%, an Income Tax + Social Contribution of 34% and applying Equation 1, we have a WACC of 10.82%.

TABLE C.5 presents a comparison summary between the project's financial indicators and the benchmarks.

***TABLE C.5**: Project IRR x WACC.*

Project IRR	WACC
8,62%	10.82%

The benchmark analysis was used (Option III of CDM tool) and it showed that project's indicator are less favorable than benchmark, then, it can be said that the CDM Project Activity cannot be considered as financially attractive.

Sub-step 2d - Sensitivity analysis

The three variables that might affect the project's finance are (i) the electricity price, (ii) the total amount of investment and (iii) the O&M Cost. As MONEL required to the regulators change in the assured energy, Project Participants present in the sensitivity analysis scenarios with the increase projected by MONEL (more 2 MWavg) and other variations. The variation in the assured energy reflects variation in the Plant Load Factor. The sensitivity analysis considers just the scenarios, which contribute to increase the project's financial and economic attractiveness with the objective to confirm how solid the sub-step 2b and 2c's analysis is. These parameters were used because:

- The electricity price and the assured energy (or the load factor) are the unique parameter that can influence the revenues of the project. Regulators Agents determine the assured energy and the electricity price is established in the Power Purchase Agreements (PPAs). All evidence related to these values are supplied to the DOE during the validation process;
- The operational expenses of the project are, in general, taxes and spending defined by regulators, The O&M Cost (Operation and Maintenance Cost) can suffer changes, but its variance does not affect significantly the IRR;

- The total amount of investment represents the most important cash outflow of the project.

It is important to say that the electricity price is established in the PPAs and the price is firmed in R$ 124.52/MW. The investment amount is fixed as it was presented for the Funding Bank (BNDES) and as plant is already in operation this parameter cannot decrease, The official assured energy of the project is 43.8 MW (avg) and PPs expect that the assured energy can increase 2MWavg (4.64%). The O&M Cost was based in the contract established with the company responsible, therefore, it is unlikely that these items can suffer alteration that will contribute to a different increase in the project's financial and economic attractiveness that will not be covered in the range of variation between 0 and 10%. For this reason, the mentioned range of variation covers more than the probable scenarios.

TABLE C.6 presents the results for the main parameters variation, which can affect the project's cash flow and TABLE C.7 presents the results considering current values of O&M for the first four years of project operation[21].

***TABLE C.6**: Results of sensitivity analysis of HPP Alzir dos Santos Antunes investment project.*

VARIATION ON ELECTRICITY PRICE UNTIL 2040				
Projected Situation	**MWh Price**	**Project IRR**	**Benchmark**	**Difference**
0%	**R$ 122.63**	**8.62%**		↓ 2.20%
5%	R$ 130,75	8.70%		↓ 2.12%
10%	R$ 136,97	8.77%		↓ 2.05%
VARIATION ON INVESTMENT TOTAL AMOUNT				
Projected Situation	**Investment**	**Project IRR**		**Difference**
0%	**R$ 280,970,800**	**8.62%**		↓ 2.20%
-10%	R$ 252,873,720	8.66%		↓ 2.16%
-5%	R$ 266,922,260	8.64%		↓ 2.18%
VARIATION ON O&M COST				
Projected Situation	**O&M Cost**	**Project IRR**	**10.82**	**Difference**
0%	**R$ 4.30/MWh**	**8.62%**		↓ 2.20%
-10%	R$ 3.60/MWh	8.69%		↓ 2.13%
-5%	R$ 3.80/MWh	8.67%		↓ 2.15%
VARIATION ON ASSURED ENERGY				
Projected Situation	**Assured Energy**	**Project IRR**		**Difference**
0%	**43.8 MW**	**8.62%**		↓ 2.18%
10%	48.18 MW	9.65%		↓ 1.17%
5%	45.99 MW	9.14%		↓ 1.68%
4,64%*	45.83 MW	9.11%		↓ 1.71%

[21] O&M cost per MWh were calculated using Assured Energy Generation data provided by Project Proponent. All evidence has already been made available for Validation/Verification body.

TABLE C.7: Variations in Project IRR due to variation in O&M values, considering actual values for the first four years of operation.

VARIATION ON O&M COST				
Projected Situation	**O&M Cost**	**Project IRR**	**Benchmark**	**Difference**
Yr of Project Implementation[22]	**R$ 4.30/MWh**	**8.62%**	**10.82%**	2.20%
2009	R$ 4.00/MWh	8.65%		2.17%
2010	R$ 4.53/MWh	8.60%		2.22%
2011	R$ 4.23/MWh	8.63%		2.19%
2012	R$ 7.16/MWh	8.35%		2.47%
2013	R$ 5.30/MWh	8.53%		2.29%

The sensitivity analysis demonstrates that HPP Alzir dos Santos Antunes project is not financially attractive once the entrepreneurship's internal rate of return is lower than the reference indicator in all scenarios analyzed.

The CDM "Tool for demonstration and assessment of additionality" says that:

"If after the sensitivity analysis is concluded the proposed CDM project activity is unlike to be the most financially attractive (as per step 2c), then proceed to Common Practice Analysis". As the project has already passed the common practice analysis (Section C.2) and the regulatory surplus test, it is safe to say the project is additional.

Result: The proposed is unlike to be the most financially attractive.

THE PROJECT IS ADDITIONAL.

[22] 2009, before September.

D.
MONITORING PLAN

D1. MONITORED DATA AND PARAMETERS

The next tables present all parameters that will be monitored, as per CDM methodology ACM0002, v.15.0. Data and parameters not monitored presented in CDM approved methodology were not used in this Project.

Data or Parameter Monitored	$EG_{facility}$
Unit of Measurement	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Data Source	Electricity meter(s)
Measurement Methodology	The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid
Data Uncertainty	Low
Monitoring Frequency	Continuous measurement and at least monthly recording
Reporting Procedure	Monitoring report at the end of each crediting period
QA/QC[23] Procedure	Cross check measurement results with records for sold electricity
Notes	-

Data or Parameter Monitored	$EF_{grid,CM,y}$
Unit of Measurement	tCO_2/MWh
Description	Combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the latest version of the CDM "Tool to calculate the emission factor for an electricity system"
Data Source	As per the CDM "Tool to calculate the emission factor for an electricity system"
Measurement Methodology	As per the CDM "Tool to calculate the emission factor for an electricity system"
Data Uncertainty	Low
Monitoring Frequency	As per the CDM "Tool to calculate the emission factor for an electricity system"
Reporting Procedure	Monitoring report at the end of each crediting period
QA/QC Procedure	As per the CDM "Tool to calculate the emission factor for an electricity system"
Notes	-

[23] Quality Assurance/Quality Control.

Data or Parameter Monitored	Cap_{PJ}
Unit of Measurement	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Data Source	Project site
Measurement Methodology	Determine the installed capacity based on recognized standards
Data Uncertainty	Low
Monitoring Frequency	Yearly
Reporting Procedure	-
QA/QC Procedure	Monitor changes in the installed capacity of the power plant,
Notes	
Data or Parameter Monitored	A_{PJ}
Unit of Measurement	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Data Source	Project site
Measurement Methodology	Measured from topographical surveys, maps, satellite pictures, etc
Data Uncertainty	Low
Monitoring Frequency	Yearly
Reporting Procedure	-
QA/QC Procedure	-
Notes	

The monitoring process is described as follows:

I. Procedure of Generation Data Collection

There are two data collection channels in each measurement points. A channel is used by the company for direct collection and the other one is used by Brazilian Chamber of Electrical Energy Commercialisation (CCEE) for data sent validation.

In the company, Special Measurement Area is responsible for obtaining data directly from the meters and make available in files on ".xml" format. Data obtained by the company are sent daily to CCEE through Collection System of Energy Data (SCDE) which makes the National Interconnected Grid measurement point generation and consumption data's collection and treatment.

The Special Measurement Area is also responsible for generating, at each month in the first working day, based on consultation from a meters database, the spreadsheets with the generation data, consolidated hourly, regarding the previous month. These files are sent to CCEE in ".txt" format.

The procedure quoted above might be outsourced through a Measurement Agent's hiring. In the case, the Special Measurement Area is responsible for supervising the work performed by the Measurement Outsourced Agent.

In CCEE, the collected data, though SCDE, are transferred to the software NSCL (New System of Accounting and Settlement) to accounting and financial clearance based on the CCEE's Rules and Procedures for Commercialization.

II. Data Consolidation Procedure

CCEE compares data available and if an inconsistency occurs, it will be generated a non-conformity report that will verified with CCEE the cause for the disagreement between the information.

In case of unavailability of any measurement point, due to maintenances, commissioning or for any other reason, the methodology of data estimation will be used according to the Submodule 2.1 - Collection and adjustment of the Commercialization Procedures.

III. Data Storage

The generation information, both the internally generated and the spreadsheets generated though the CCEE website, are electronically stored by the Operation and Maintenance Board.

Periodically, the Information Technology Area accomplishes an insurance backup for all company's data though a Data Server Backup.

IV. All data collected as part of the internal generation data with the third part reports

The internal information might be confronted with data available on CCEE website.

V. Calibration of Meters (measuring tools):

The calibration of meters will follow what was described on the document elaborated by National Operator of the Electric Grid (ONS) – Sub module 12.3 – Maintenance of the measurement system for billing, which establish that:

a) The periodicity for the responsible agent's preventive maintenance for Measurement System for Billing (SMF) is of 2 (two) years at the most. That periodicity can be altered in function of occurrence history for all facilities.

b) The preventive maintenance can be postponed by the period of up to 2 (two) years, in the case of happening inspection in the measurement point. The postponement of that maintenance starts to apply from the inspection date.

E.
QUANTIFICATION

E1. BASELINE

ACM0002 v.15.0 establishes that baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.

The methodology assumes that existing grid-connected power plants and the addition of new grid-connected power plants would have generated all project electricity generation above baseline levels.

The baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} x EF_{grid,CM,y}$$

(Equation 3)

Where:

BE_y	=	Baseline emissions in year y	(tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y*	(MWh/yr)
$EF_{grid, CM, y}$	=	Combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"	(tCO_2/MWh)

Calculation of $EG_{PJ,y}$:

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility}$$

(Equation 4)

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y*	(MWh/yr)
$EG_{facility}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y	(MWh/yr)

Calculation of $EF_{grid, CM, y}$:

To calculation $EF_{grid,CM,y}$, the Brazilian DNA makes available data of the Dispatch Data analysis operating and build margin emission factors, following the steps from the CDM latest version of "Tool to calculate the emission factor for an electricity system" Version 04.0.0.

The Dispatch Analysis was chosen because, according to the Brazilian DNA[24], it is the most accurate and recommended method if information available. For this reason, the emission factor ex-post must be updated annually during monitoring and verification processes.

[24] Designated National Authority.

The CO_2 emission factors resulting from the power generation in the Brazilian National Interconnected System are calculated based on the generation records of plants centrally dispatched by ONS. The procedures for calculation were elaborated in cooperation between ONS, the Ministry of Mines and Energy and the Ministry of Science and Technology. When calculating the operating margin and build margin emission factors, only grid power plants were considered.

To guarantee an accurate analysis, CDM Guidelines recommend that a three-year database should be used, The Brazilian Government has published the national grid emission factor since the year of 2006. As the project start date is September, 3 and the project has already started its operations, the emissions factor from September 3, 2009 to September 2, 2013 were used and an average was applied to the following years (2014, 2015, and 2016).

All data used to calculate the ex-ante building and operating margin emissions factor in the Brazilian Designated National Authority website[25].

Regarding the cohort of the power units to be included in the building margin, in terms of vintage of data, project participants can choose between one of the following options:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group at the time of GHG Project Plan submission to the DOE[26] for validation. For the second crediting period, the build margin emission factor should be updated on the most recent information available on units already built at the time of the submission of the request for renewal of the crediting period to the DOE. For the third crediting period and beyond, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period and beyond, the built margin emission factor calculated for the second crediting period should be used.

Option 2 was selected.

The combined margin emission factor is calculated as follows:

$$EF_{Grid,CM,y} = EF_{Grid,OM,y} x W_{OM} + EF_{Grid,BM,y} x W_{BM}$$

(Equation 5)

Where:

$EF_{Grid,OM,y}$	=	Operating margin CO_2 emission factor in year *y*	(tCO_2/MWh)
$EF_{,Grid,BM,y}$	=	Build margin CO_2 emission factor in year *y*	(tCO_2/MWh)
W_{OM}	=	Weighting of operating margin emissions	%

[25] http://www.mct.gov.br/index.php/content/view/72764/Fatores_de_Emissao_de_CO_sub_2_sub__pela_geracao_de_energia_eletrica_no_Sistema_Interligado_Nacional_do_Brasil.html

[26] Designated Operational Entity

W_{BM}	=	Weighting of build margin emissions	%

The tool to calculate the emission factor for an electricity system recommends that the following default values should be used for W_{OM} and W_{BM}:

(a) Wind and solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.
(b) All other projects: W_{OM} = 0.5 and W_{BM} = 0.5 for the first crediting period and W_{OM} = 0.75 and W_{BM} = 0.25 for subsequent crediting periods, unless otherwise specified in the approved methodology which refers to this tool.

The following emisions factors were applied:

- EF_{GRID, CM_2009} = 0.1301 tCO_2e/MWh
- EF_{GRID, CM_2010} = 0.3099 tCO_2e/MWh
- EF_{GRID, CM_2011}= 0.1997 tCO_2e/MWh
- EF_{GRID, CM_2012} = 0.3599 tCO_2e/MWh
- EF_{GRID, CM_2013} = 0.4305 tCO_2e/MWh
- $EF_{GRID, CM\_2014 - 2016}$ = 0.4125 tCO_2e/MWh

The quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* was calculated considering the assured energy and the number of hours of project operation, from September 3, 2009 to September 2, 2016. The total value obtained is:

$$EG_{PJ,y} = 2{,}617{,}138 \text{ MWh}$$

Finally, baseline emissions for the whole 7-years crediting period result in:

$$BE_y = 787{,}692 \ tCO_2e$$

For HPP Alzir dos Santos Antunes project, option (b) was considered, Baseline emissions calculation are provided in Excel Spreadsheet attached to this document (*Appendix 1 Emission Reduction Calculation*).

E2. PROJECT SCENARIO

According to CDM approved methodology AMC002, v.14.0.0, for most renewable power generation project activities, PEy = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

(Equation 6)

Where:

PE_y	=	Project Emissions in year y	(tCO_2/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y	(tCO_2e/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y	(tCO_2/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y	(tCO_2/yr)

For HPP Alzir dos Santos Antunes, $PE_{FF,y} = 0$ and $PE_{GP,y} = 0$.

Emissions from water reservoir:

For hydropower project activities that result in new reservoirs and hydropower project activities that result in the increase of existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:

(a) If the power density of the project activity (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} x TEG_y}{1000}$$

Where:

$PE_{HP,y}$=	=	Project emission from water reservoir	(tCO_2e/yr)
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydro power plants in year y	(Kg CO_2e/MWh)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y	(MWh)

(b) If the power density of the project activity is greater than 10 W/m2, $PE_{HP,y}$= 0.

The power density of the project activity (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD	=	Power density of project activity	(W/m²)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity	(W)
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity, **For new hydro power plants, this value is zero**	(W)
A_{PJ}	=	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full	(m²)
A_{BL}	=	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full, **For new reservoirs, this value is zero**	(m²)

The power density of HPP Alzir dos Santos Antunes is 13.55 MW/km², which is higher than 10W/m², and for this reason, $PE_{HP,y}$=0, Therefore, **PE_y=0.**

E3. LEAKAGE

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

Therefore, for HPP Alzir dos Santos Antunes project, **LE_y=0.**

E4. UNCERTAINTY

Uncertainty was accounted for using the instructions of "IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gases Inventories", Decisions trees presented in Figures 2,1 and 2,2 of the publication were followed to select best methods to calculate CO_2 emissions from stationary combustion and net calorific values,

According to the publication consulted [27], uncertainty arises from : the adequacy of the statistical coverage of all sources categories and the adequacy of the coverage of all fuels.

As per IPCC Good Practice Guideline, overall uncertainty in activity data is a combination of both systematic and random errors. According to experts, uncertainty resulting from the two errors is probably in the range of ± 5%. For places with less-developed energy data systems, this could be considerably larger, probably 10%.

Fortunately, the energy data system applied in this project is the one regularly monitored and provided by the major entity responsible for the plants included in the National Interconnected System and, for this reason, the data can be considered in the ± 5% range.

Uncertainty should also be addressed regarding energy generation data. For this matter, certificates of the four meters (Model ELO 2180) were analyzed in order to understand the level of uncertainty associated to the equipment. According to the equipment manuals presented (available for consultation), the meters are calibrated in a way that uncertainty is always lower than 0.02%. MONEL assures the equipment monitoring and calibration, and, for this reason, we conclude that uncertainty is above the 10% required by ACR.

Both data necessary for ERT calculations carry a great level of confidence, since the Emission Factors are supplied by the Government and Energy Generation data is also controlled by Government bodies (in case of Brazil – National Operator of the System – ONS). For this reason, it is certain to assure that uncertainty is addressed.

At the time of project verification, in order to calculate Ex-post emissions reductions, all data will be required in order to carry out a more specific statistical analysis.

[27] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gases Inventories – Vol. 2 Energy – page 2,15.

E5. REDUCTIONS AND REMOVAL ENHANCEMENTS

According to ACM0002 v.15.0, the emissions reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

(Equation 7)

Where:

ER_y	=	Emissions reductions in year *y*	(tCO_2e/yr)
BE_y	=	Baseline emissions in year *y*	(tCO_2e/yr)
PE_y	=	Project emissions in year *y*	(tCO_2e/yr)
LE_y	=	Leakage in year *y*	(tCO_2e/yr)

HPP project will reduce 787,692 tCO_2e in a seven-year crediting period (112,527 tCO_2e per year).

All detailed calculations are provided Excel Spreadsheet attached to this document (*Appendix 1 Emission Reduction Calculation*).

E6. EX-ANTE ESTIMATION METHODS

The project consists of the implementation of one hydropower plant of a 74MW-installed capacity. The ex-ante emission reduction estimates were calculated based on the Brazilian National Interconnected System emission factors data provided by the Brazilian DNA, annually updated.

The calculation of total energy generated was based on the project proponent documentation, such as executive project data, and equipment specifications.

F.
COMMUNITY & ENVIRONMENTAL IMPACTS

F1. NET POSITIVE IMPACTS

The HPP Alzir dos Santos Antunes project, as any other project in Brazil with this installed capacity, was approved under the condition of the realization of an Environmental Impact Assessment (EIA), to understand probable impacts on physical, biotic and anthropogenic spheres. The impacts were identified and classified, according to their magnitude and importance and, later, mitigation, and potentiating measures were established.

The construction of hydropower plants overall involves a series of industrial processes with different environment impacts. The level of impact is related to the implementation phase, to the operation phase (technology applied), to the type of management (use of safety equipment, waste, etc.), environment characteristics (biodiversity, region occupation, etc.), and institutional characteristics (planning capacity). The impacts were assessed considering all those factors.

As results of this study, the following activities were determined as probable impact factors:

- People mobilization
- Expropriations
- Land preparation
- Increase in people density flow
- Camping infrastructure, construction and industrial site
- Upstream caisson construction
- Construction of diversion tunnel, downstream caisson and surface
- Equipment, generation structure and spillway construction
- Reservoir filling and operation
- Further operation

For each of those factor presented, impacts were foreseen and mitigation and prevention actions were planned, The general impacts previewed in HPP Alzir dos Santos Antunes EIA were:

- Employment generation
- Noise
- Traffic intensification and change in reached infrastructure
- Wastewater and waste generation
- Water and soil contamination
- Increase of erosive processes
- Removal of vegetation
- Scaring wildlife
- Macrophytes development
- Increase of disease vectors
- Seismic disturbances
- Relocation of affected population
- Changes in the aquatic habitat
- Losses on agricultural areas

- Valuation of the land market
- Pressure on the public infrastructure
- Changes in population income
- Increase of conservation areas and encouraging preservation
- Increase on energy supply

Most of those factors are related to the construction and beginning of operations, thus, the impacts related to them are not long lasting. Normally, when considering hydropower plants, most of the impacts are related to the construction of the reservoir, which occupies a large space, causing major changes in the landscape and in the fauna and flora habitats, as well as in the infrastructure. However, as previously explained, HPP Alzir dos Santos Antunes presents great power density, what means that the reservoir area is very small, in comparison with the power generated. That happens because **the plant is practically run-of-the-river, since it uses the water flow that comes mostly from HPP Passo Fundo and there is minimal storage.**

It should highlighted that most of the impacts were previewed for the construction period and **previously prevented**, as specified in the environmental documents provided.

Based on the predicted impacts, 24 programs were planned, aiming at minimizing and mitigating the social and environmental impacts of entrepreneurship in the physical, biotic and anthropic fields. Those programs were designed before the project implementation and they compose the Basic Environmental Project (from Portuguese *Plano Básico Ambiental*[28]*).* As follows, each program is detailed, concerning the general objectives, what actions have been implemented, which results have been gathered to present time and the programs current situation.

As further explained, some of those programs were implemented aiming at mitigating short-term impacts and are no longer necessary. Some of those are still ongoing and others are permanent. The main reference used to provide the information described below is the document *"Relatorio Renovação LO MONEL"*, which consists in a full report submitted to the environmental agency in order to request renewal of the operation license. The report brings information from the period between 2009-2012. However, information on permanent or ongoing programs were also provided during the descriptions, based on reports from 2013. All the documents used are available for consultation.

The programs predicted in the project PBA are presented as follows (items 1 – 24). Two other environmental measures outside the programs are also presented. The information presented came mostly from two reports:

- Operation License Renewal Report – 2009 – 2012[29]: consists of full report presented to the environmental agency (FEPAM), presenting all the information regarding the 24 programs from the project implementation until the end of 2012. Some of the programs were concluded at this period and others are permanent or are still ongoing. MONEL sends quarterly reports to FEPAM with information about the activities being executed.

[28] Denotation used specifically by the Rio Grande do Sul State Environmental Agency.
[29] *Relatório FEPAM 2009-2012.pdf*

- Quarterly reports[30] sent to FEPAM in April and September 2013 : consists of the quarterly reports involving the situation of the programs in 2013, before the first verification period (September 2013).

Both of the documents are available for consultation, as well as complementary documentation.

1) PROGRAM OF CONTROL OF EROSIVE PROCESSES (PERMANENT)

Description:

This program was created in order to follow the occurrence and development of the erosive processes in the margins of the reservoir, avoiding the silting and the consequent reduction of its useful life. Moreover, it intended to reintegrate the areas of the working fields and of the mandatory excavations in the regional landscape.

The impacts associated with erosive processes are mostly those related with the construction of the plant. This program main goal was to identify focus of erosion and establish operational strategies to prevent and promote the control over the erosive processes resultant from the plant.

Current situation:

The monitoring of the erosive processes is carried out through monthly surveys in order to identify focus of erosion, such as furrows and indication of landslide.

In addition to the marginal areas of the reservoir, monitoring included areas with earthmoving (construction site and internal accesses) to identify the occurrence of erosive processes and aiming to predict instabilities and indicate preventive and/or corrective measures. The results of these campaigns and actions taken were presented in specific technical reports referred for FEPAM, Annexes to Quarterly Reports.

Of the ten points of slipping detected in 2010, nine have reached full degree of stability by 2012 and now are only observed in the routine inspections of the reservoir. Only point 10, located downstream of the water intake, continued to be systematically monitored. As for the five points detected in 2011, by 2012 they were still in the process of stabilization. Although it was not required, MONEL chosen to continue their monitoring until de end of 2013. FIGURE F.1 presents before and after registrations of all those six points (9 – 15).

Point 10: Before (2009) and After (2013)

[30] *Relatório FEPAM Abr 2013.pdf and Relatório FEPAM Set 2013.pdf*


Point 11: Before (2011) and After (2013)


Point 12: Before (2011) and After (2013)


Point 12: Before (2011) and After (2013)


Point 15: Before (2011) and After (2013)

Point 15: Before (2011) and After (2013)

***FIGURE F.1**: Comparison of the erosive processes before and after implementation of the environmental program measures by MONEL.*

It is noted that all 15 erosive processes identified are mostly small isolated landslides, resultant from the association of a steep relief with a low covering of the soil. Those factors do not represent impacts over the reservoir nor to the protected areas and surroundings.

In addition, the monitoring campaigns carried out up to the date have showed a continued natural regeneration, due to the isolation of the points, which allowed the development of lianas associated with tree species.

After the restoration of the former construction site was completed, added to the fact there were no registers of large-scale ruptures that could compromise the margins stability or the reservoir lifetime, the monitoring started to be conducted twice a year.

Conclusion:

It was concluded that there were no significant erosive processes that could compromise the affected area and surroundings. All data is presented in the mentioned reports (available for consultation).

The associated environmental impact was addressed.

2) GROUNDWATER MONITORING PROGRAM (CONCLUDED)

Description:

This program was created in order to monitor both the groundwater level and quality, due to the concerns regarding the environmental impacts associated: (i) lifting of the groundwater and; (ii) water and ground contamination.

A monitoring program of subsurface waters is justified by the need to monitor changes in the level and quality expected for the influence are of HPP Alzir dos Santos Antunes. Despite the region's low permeability and lack of sedimentary rocks on the banks of the dam, cracks and failures can lead the reservoir water to great distance over many years.

Current situation:

For sample matters, six wells and five piezometers were selected, in order to monitor the groundwater level and quality changes in the direct influence area of HPP Alzir dos Santos Antunes. The program started in June 2008, with the monitoring of the community-use wells and piezometers. In October 2011 an After

Filling Monitoring Plan was filed in the regional environmental agency (FEPAM – *Fundação Estadual de Proteção Ambiental*). Samples were collected each semester.

Once the water from the wells serves human consumption, the parameters established for the analysis were those indicated in the Federal Law ***Portaria 518/04***, of the Health Ministy, which controls water quality parameters in Brazil. The monitoring was carried out from 2008 to 2012, when MONEL requested a new operation license to the environmental agency. In that time, the water groundwater quality and levels were normal, with no signs of influence of HPP Alzir dos Santos Antunes activities in the affected area water quality. For that reason, the program was concluded by the end of 2012.

Conclusion:

The results presented no sign of HPP Alzir dos Santos Antunes influence over the region groundwater quality. All results, including the parameters used and analysis results, are presented in the mentioned reports (available for consultation).

The associated environmental impact was and addressed.

3) RECOVERY OF DEGRADED AREAS (CONCLUDED)

Description:

This program was created to establish procedures to reduce the impacts caused by the implantation of the HPP Alzir dos Santos Antunes and to recuperate the degraded areas of the working field, aiming its future use. The activities in this program involved periodic meetings with the company that executed the sites, in order to define responsibilities and training activities to the ones involved in the program's execution. A company was sub-hired by Monjolinho to provide the necessary data to identify the area to be recovered, which guided the planning of the recovery activities and corrective measures to be adopted.

Current situation:

A Plan of Recovery of Degraded Areas was developed and approved by the environmental agency in May 2009. Five areas were identified, as presented in FIGURE F.2.

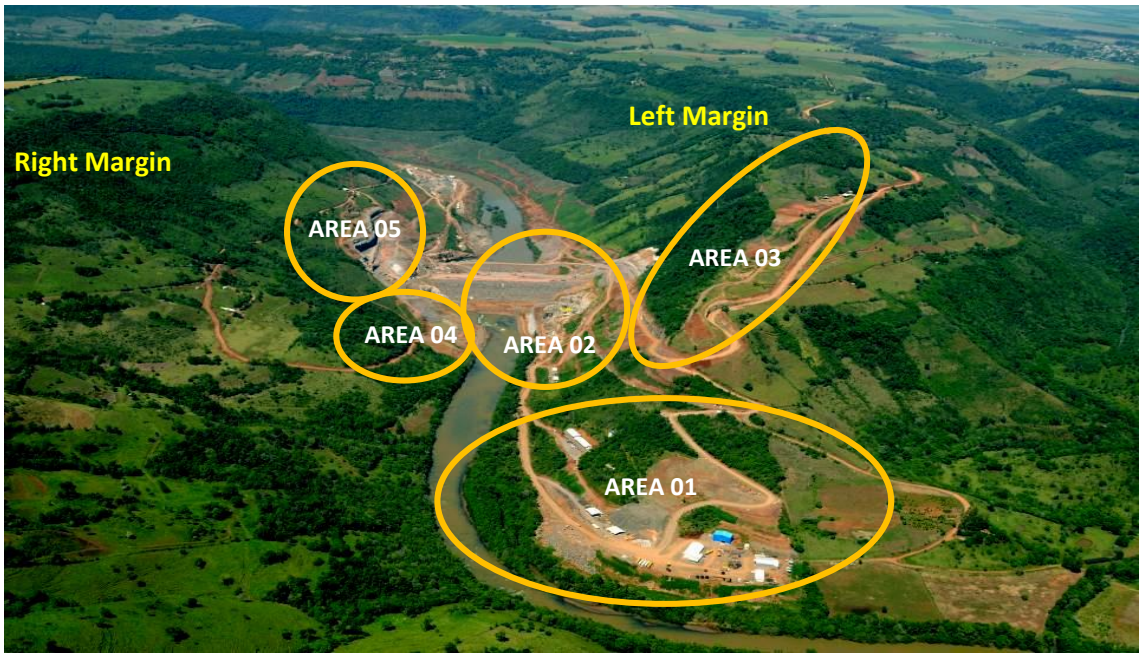


FIGURE F.2: Demonstration of the five degraded areas that should be recovered by the program.

The activities consisted of demobilization of the former construction site, removing waste and rubbish, land clearing and recovery. Later, those areas went under a reforestation process.

All of five areas were edaphically recovered by June 2011, when the reforestation program started. For this reason, the program is considered successfully concluded. FIGURE F.3 (a, b, c and d) bring examples of before and after situations after the program's implementation.

After the complete recuperation of all identified areas[31], in 2014, the program began to be part of HPP Alzir dos Santos Antunes Reforestation Program, which is monitored twice a year.

(a) Area 04 in 2009.

(b) Area 04 in 2012.

[31] Information regarding the recovering of degraded lands can be found at document "*Relatório Resumo das Atividades Desenvolvidas pelo Programa de Recuperação de Áreas Degradadas, Período de maio de 2009 a junho de 2011, elaborado em novembro de 2012".*

(c) Area 05 in 2009.

(d) Area 05 in 2012.

FIGURE F.3: *Comparison of the degraded (before) and recovered (after) areas because of the implementation of MONEL's environmental program.*

Conclusion:

All five areas were recovered and are under a specific reforestation program.

The environmental impact was and addressed.

4) MONITORING OF MINING INTERFERENCE (CONCLUDED)

Program concluded at the time of the project implementation.

5) SEISMIC MONITORING PROGRAM

Description:

The seismic monitoring was created to analyze the existence of seismic behavior due to the project implementation. The PBA established a three-year monitoring period, after the reservoir filling.

Current Situation:

The program's activities started in November 2007 and are controlled by the Technological Research Institute (IPT, from Portuguese, *Instituto de Pesquisas Tecnológicas*). The monitoring is executed as a partnership between MONEL and HPP Itá (owned by Tractebel Energia). Both of the plants use data from the seismic stations installed at the HPP Itá area, in Santa Catarina State. They belong to the Itá and Machadinho Seismic Network (from Portuguese, *Rede Sismológica de Itá e Machadinho*). Two of them (ITA 1 and ITA 4) are closer to Monjolinho (approxmatelly 35km).

In addition to the measures of the station, population is also consulted in order to know if seismic disturbances are being noticed. If a disturbance is felt in the project area, a seismic station should be provided to the location.

The reservoir filling was finished on June, 22, 2009 and, therefore, the monitoring should go on for at least three years, which is what happened. Until 2012, monthly reports were developed and attached to the quarterly reports sent to FEPAM.

The final report from 2012, the last year of monitoring, confirms that no seismic disturbances with epicenter in HPP Alzir dos Santos Antunes area were registered nor informed by the local population. The monitoring was kept until the end of 2012 as a recommendation of IPT, but the results were the same.

Conclusion:

The impact concerning seismic disturbances was monitored for three years, as a recommendation of FEPAM and IPT. Since no disturbances were registered, the monitoring was successfully concluded and the impact predicted did not and probably will not affect the region. For that reason, the impact has been addressed.

6) SUPERFICIAL WATER QUALITY MONITORING PROGRAM (PERMANENT)

Description:

This program was created to monitor the limnology parameters of the rivers Passo Fundo and Erechim, in the HPP`s area of influence, gathering the technical information necessary to the identification and mitigation of possible impacts generated by the formation of the reservoir on the quality of water, and to the maintenance of quality classes and their previous uses.

This program should be integrated to the Monitoring Program of Subterraneous Waters and to the Contribution Basin Management program. Monthly campaigns were predicted for sampling the physical chemical and biotic parameters during the period of one year from the beginning of the construction, becoming held every three months till the filling of the reservoir. During this filling, the sampling should be done weekly. Afterwards, the campaigns should be monthly during the first six months of the reservoir, passing to a three-month basis after this period. To this program, performance reports were predicted to be written every three months. After the first year of monitoring, the periodicity of the samples must be evaluated along with the state environmental agency– FEPAM.

Current situation:

The program started in October 2007 through the monitoring of 11 points located in the reservoir's influence area, as showed in Figure F.4.

After the reservoir's filling, 23 campaigns were carried out. Up to the 19th, monthly and quarterly samplings were performed, according to the parameter analyzed. In the monthly samplings 26 physical, chemical and hydrological parameters were analyzed. In the quarterly samplings, aquatic communities were also taken into account, totaling 28 parameters.

In addition to superficial water, vertical profiles each five meters were assessed, considering: pH, DBO, DQO, water temperature and dissolved oxygen, nutrients, total iron, manganese. Those parameters were measure in two different depths by three stations located in the HPP Alzir dos Santos Antunes reservoir.

In October 2011, a work plan was filed at FEPAM, containing guidance to go on with the monitoring. After December 2011, the monitoring of two stations (URGO and TIJ) was discontinued. After the reservoir filling, 25 campaigns were realized in the nine spots left, with monthly periodicity. After the 20th campaign, monitoring started to be carried out quarterly.

The results show that, generally, the parameter indicate good quality water, within the Class 1[32] Standard. No patterns of chemical or thermic stratification were observed. The organic content evaluated in terms

[32] Brazilian Law CONOMA 357/90, which classifies superficial water. According to CONOMA, Class 1 waters are those that can be used to: (i) human consumption, after simplified treatment; (ii) protection of the aquatic communities; (iii) first contact

of DBO and DQO was low in the sampling stations. The more restrictive parameters regarding water quality were total phosphorus in the stations of Erechim and Passo Fundo rivers and in other three stations of the reservoir. The 2013 campaign has verified a "good" water quality index. Monitoring will continue permanently.

Conclusion:

Overall, there are no concerns regarding superficial water quality. Monitoring will keep happening. All the results up to the data are presented in the mentioned reports (available for consultation).

The associated environmental impact is controlled and permanently addressed.

7) CLEANING OF THE ACCUMULATION BASIN (CONCLUDED)

Description:

This program involves the following activities: removal of the vegetation, removal of the vegetation inside the accumulation basin, cleaning of the construction site area and all the accesses related to the dam. The cleaning of the flooded area is necessary to reduce the changes of the uncontrolled growth of phytoplankton, zooplankton and aquatic plants, which could find an excessive amount of nutrients in the organic matter in the areas. The process is meant to avoid the occurrence of eutrophication.

Current Situation:

The program removed the vegetation located at the HPP Alzir dos Santos Antunes accumulation basin following the proportions: 40% of advanced secondary forest, 60% of medium and initial secondary forest, according the vegetation coverage map developed, containing the location of the mentioned areas.

The program addressed the possibility of scaring the wildlife, by performing their relocation to safe environment and the rescuing of species.

Conclusion:

The program was performed as planned in the PBA and it was completed at the project's implementation phase. More detailed information is available for consultation.

The impact has been addressed.

8) CONTRIBUTION BASIN MANAGEMENT PROGRAM (CONCLUDED)

Description:

This program's main objective was to conciliate the anthropic use of the reservoir's contribution basin, looking for ideal conditions for environmental generation, conservation and security. The associated activities should be developed throughout the whole execution of the PBA, until May 2010.

Current situation:

recreational purposes (swimming, diving); (iv) irrigation of greenery consumed raw and fruits that grow close to the soil, also consumed raw; and (v) protection of aquatic communities in indigenous territory.

The Program was developed during the Project's implementation, with the Municipal Governments and local communities, focusing on the solid waste generation and final disposal. The program was concluded on 2010.

Conclusion:

The associated impact has been addressed.

9) ENVIRONMENTAL EDUCATION PROGRAM (PERMANENT)

Description:

The program consists in engaging the community in the project activity through activities along the community's schools, focusing on the training of municipal schoolteachers, to act in the municipalities covered by the entrepreneurship. In addition, educational activities with the residents should also be carried out. This program should have intense integration with the programs of Social Communication, Prevention of Accidents and Public Health and Conservation and Use of the Reservoir Waters and its Surroundings.

Current situation:

According to the PBA, Environmental Education activities should be carried out until two years after the filling of the reservoir. The program was initiated on 2007 and developed activities such as lecturing, workshops and site visits. It involved rural communities, indigenous and schools of Benjamin Constant do Sul, Faxinalzinho, Entre Rios do Sul and Nonoai. From 2014 on, activities were included in the HPP Environmental Management Program and are developed by their own team, in partnership with the Environmental Police.

The activities that continue to be carried out are described as follows:

- Plant Visitation: It is the major activity of the environmental program after 2010. It promotes de site visitation and covers the local community, such as students of regional schools, teachers and interested population. Visits are previously scheduled and each group is composed by at most 25 individuals. The visitors participate in lectures regarding the plant's technical operation, the environmental licensing process, the ongoing environmental programs and the entrepreneur's responsibilities from implementation to operation phase. The visitor can choose one of MONEL's predetermined themes: (i) recycling; (ii) composting; (iii) fauna and flora protection; (iv) environment pollution and (v) other subjects with environmental significance. The visit also includes an ecologic trail subdivided in two stages. The first one consists of a visit of the outside main structures of the plant. In the second stage, there is an interpretative trail with about 1.500 meters, located at the left margin of Passo Fundo River, in Nonoai city. The trail contains different environments, such as recovered lands and forests in different succession stages. In addition, there seedlings are frequently distributed in order to raise awareness about forests preservation.
- Land Patrolling and Environmental Awareness Activities: In 2012 second semester an agreement was made between the Regional Environment Society of Nonoai (*Associação Regional do Meio Ambiente de Nonoai)* and the 3rd Group of Environmental Police (*3° Grupo de Polícia Ambiental*), in order to carry out land patrolling in the HPP Alzir dos Santos Antunes reservoir surroundings.

Before 2012 that activity was realized by MONEL's permanent environmental education team. This partnership aims to show the local population the importance of the natural resources preservation, in order to maintain the ecosystem balance. The program also counts with a shipped patrolling, to prevent illegal hunt and fishing in the entrepreneurship area.

FIGURES F.4 to F.6 present registers of the activities mentioned above.

FIGURE F.4: *Demonstration of the first route of site visit.*

FIGURE F.5: *Demonstration of the second route of site visit.*

FIGURE F.6: Registers of visitors in HPP Alzir dos Santos Antunes.

Conclusion:

The environmental program was created as a potentiating measure aiming to engage the affected community in the project activity. The visits occur regularly and lectures are still carried out in community sites. The program is considered effective and it is helping not only raising awareness about preservation, but also providing technical information about energy generation in Brazil. Additional information can be found at the mentioned reports (available for consultation).

The potentiating measures have been successfully implemented.

10) REFORESTATION PROGRAM (ONGOING)

Description:

In constant and intense correlation with the Flora Rescue Program, this program aims at elaborating reforestation projects in the permanent preservation areas (from Portuguese – *APP – Área de Preservação Permanente*) and other available for planting. Besides, the program also comprises the production and supply of branches obtained from seeds collected in the area of the entrepreneurship's direct influence. The program seeks the preservation of the local genetic material. Until the phase of reservoir's fulfillment, it two thousands branches of native species should be planted.

The program should be fully implemented in a 15 years period and, until the eighth year; all the APP area should be contemplated with the planting of native seedlings, in areas where there is need.

Current situation:

The activities started in October 2007, performed by a company named Biolaw. At the time, some of the activities required for obtaining the first operation environmental license were already developed, such as surveying, mapping and classification of the areas to be vegetated, reforestation project, identification

of mothers and implementation of nursery facility. Activities such as planting, management of the forest nursery and monitoring of the reforested areas were also performed.

By the month of March, in 2011, the forest nursery changed location, from Faxinalzinho to Nonoai, to an area closest to the plant. After that, the program began to be executed by another business (DSA). The seeds collection was performed by pruning small fruit branches of tress or collection the fallen fruit on the ground. About 200 kg of native species seeds were collected. The seeds that were not planted right after the collections were stored in a refrigerated environment for later tillage in tubes or in seedbeds for future transplanting when the appropriate time after germination.

Once defined, the object of reforestation areas were marked by wooden stakes up to 1 meter long. The dimension of the holes are of 0.15 x 0.15 x 0.15 meters. The average spacing between the holes was 2.0 meters, resulting in a density of 2500 holes per hectare. In 2012, about 326,000 seedlings were planted, covering an area of approximately 120 hectares. A random distribution of the species in the area to be reforest was applied, following the proportion of 50 % of pioneering, 40 % of early secondary and 10 % of late secondary species. Currently, planting is performed by using an emulsifier gel, due to its ability to retain water during a three-month period. This measure intends to guarantee a greater success level in the development of the seedlings. The program also includes the monitoring activities, such as crowning of the seedlings, pest combat, mowing and replanting.

Today, the seedlings production in the nursery is realized using seedlings and planting tubes. Over 340,000 seedlings of 77 species have already been produced.

FIGURE F.7 presents registers of the program implementation.

FIGURE F.7: *Registers the reforestation program: nursery, seeds, reforested areas.*

Conclusion:

The program has been successfully implemented. The reforested areas have shown significant development and 140,000 seedlings will be planted by the end of 2014. More information can be found at document "*Relatório Consolidado de Reflorestamento, período 2008 a 2012, de dezembro de 2012, DSA. "*

The mitigation measure has been successfully implemented.

11) FLORA RESCUE AND SALVATION PROGRAM (CONCLUDED)

Description:

This program was created in order to develop inventories with identification and location of samples of the local flora, with the interest of conservation. The program predicted the collection of seeds and other vegetable material throughout the implementation of the HPP, in order to create a germplasm banck, allowing the production of branches to be used in the Reforestation Program. A nursery with capacity to produce 60 thousand of branches per year should be implemented.

Current situation:

The activities of this program were included in the Reforestation Program, mentioned before. The nursery was created and it is still active. The numbers of seedling production are all mentioned in the Reforestation Program description. As already mentioned, more information can be found at the document "*Relatório Consolidado de Reflorestamento, período 2008 a 2012, de dezembro de 2012, DSA."*

Conclusion:

The program was successfully implemented and it is now a part of the Reforestation Program.

The mitigation measure was successfully implemented.

12) MACROPHYTES MONITORING PROGRAM (PERMANENT)

Description:

This program has the objective of surveying the macrophytes species present in the entrepreneurship's region, identifying the potential invaders and elaborating a plan to handle such species, controlling possible biological invasions. Prospecting campaigns should be executed in the region and, after the reservoir's filling, monitoring and control campaigns of the macrophyte population in the reservoir will take place every two months.

Current situation:

Monitoring has been carried out since the reservoir's filling phase. At that time, two shipped campaigns were performed, covering the three zones presented in FIGURE F.8 and includes all streams, direct contributors from HPP Alzir dos Santos Antunes lake. The dams around the reservoir are also accounted for, near the drainages.

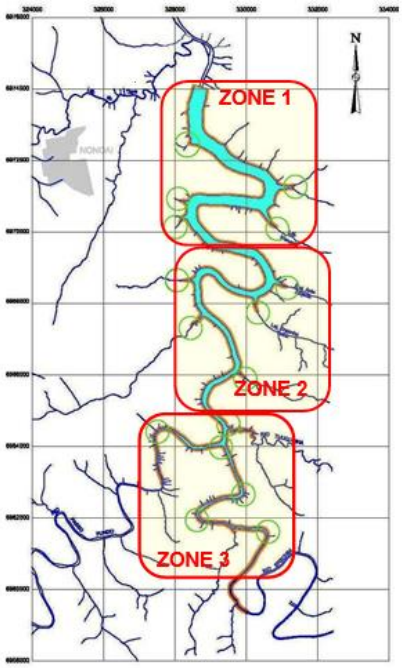


FIGURE F.8: Determined zones for macrophytes growth monitoring.

In 2009, MONEL has installed a system composed by three contention barriers (log boom) and PAD floating devices connected through a steel cable ½" and screens, in order to retain the floating material resultant from the vegetation cuts as well as the macrophyte stands.

The first barrier was implemented close to the ancient bridge, which gives access to Faxinalzinho city, 250 meters long and a retain area of 244 ha. This barrier was disabled in September 2011 because its use was no longer required, associated to the frequent depredations and risks to human safety, once it was observed that people were using the structure for leisure purposes. The second barrier was installed 1,200m from the dam axis and with 600m length and covering a retention area with 277 ha. The third and last barrier, with 100m length was installed as protection to the water intake. FIGURES F.9, F.10 and F.11 present registers of all three of them.

FIGURE F.9: First barrier of macrophytes monitoring.

FIGURE F.10: *Second barrier of macrophytes monitoring.*

FIGURE F.11: *Third barrier of macrophytes monitoring.*

The evaluation and control of the macrophytes is performed by using a quantitative criterion to determine the infestation level, according the Veja (1997) scale. This method allows the identification of fast growing populations, indicating how to implement urgent mitigating measures, according to the following levels of infestation: Level 0: no presence of macrophytes; Level 1: presence of macrophytes only noticed; Level 2: Light infestation; Level 3: Medium infestation; Level 4: Severe infestation; Level 5: Critical infestation.

The activities of the program were initiated by the end of June 2009, after the filling of the reservoir. Up to March 2010, due to the high amount of nutrients in the water, despite withdrawal efforts, especially in zones 02 and 03, the macrophytes stands were frequent and did reach level 4 of infestation. The predominant species were *Salvinia auriculata* and *Lemma sp.* Later, the infestations became lighter, in specific areas of the reservoir, except in areas of the reservoir comped by the rivers Passo Fundo, Erechim and Tijuquinha, where medium infestation was observed.

Between July and September 2011 storms and torrential rains characterized the climatological phenomena on a large scale, which affected the physical and environmental aspects of the lake. In the following period, between October 2011 and March 2012, the extreme climatological phenomena were of excessive drought. At this time, no macrophyte stands were found in the reservoir, what characterized a level 0 of infestation.

After April 2012, when the rains slowly came back to the region, macrophytes were found in the submerged vegetation, downstream HPP Alzir dos Santos Antunes, where is located the reservoir of HPP

Foz do Chapecó. In June 2012 focuses of *Salvinia auriculata* e *Lemna sp* were found next to Tijuquinha stream.

Nowadays, a level 1 of infestation is observed in monitoring. The program continues to happen and the monitoring activities are now performed twice a year. They are currently included in HPP Alzir dos Santos Antunes Environmental Management Program.

The Program has been developed since the beginning of the plant's construction. During the implementation phase and in the start of operation monitoring were carried out quarterly, through boat visits (surveys) through the reservoir. Currently, monitoring activities are realized twice a year and are included in the HPP's Environmental Management Program.

Conclusion:

The presence of isolated macrophytes is conditioned to the organic matter disposed next to the margins of the reservoir and to the small streams flowing into the lake, which provides a general low level of infestation. The species found into the lake are restricted to *Salvinia auriculata* and *Lemna sp*., the latter observed only from the mouths of streams in very small quantities.

According to the exposed data, a clear reduction in the presence of macrophytes can be observed, since the reservoir filling began. This fact can be related to the stability of water quality in the reservoir or to the lack of rains. For this reason, the reports to be delivered to FEPAM are no longer developed quarterly, but twice a year.

Regardless of the frequency of reports, MONEL remain monitoring the occurrence of macrophytes stands under the Environmental Management Program and also during surveillance activities performed by field staff. Whenever there are possible proliferation, additional reports will be provided and action will be taken.

<u>The impact has been addressed.</u>

13) FAUNA RESCUE AND MONITORING PROGRAM (ONGOING)

Description:

Throughout all the process of deforestation of the area to be flooded, two biologists and two assistants should remain on the field, being responsible for the execution of the mild rescue. Periodically, campaigns to monitor the fauna should be executed, with a staff composed by an entomologist, a herpetologist, an ornithologist and a mast zoologist, besides field assistants.

Samples of the insect fauna and other disease vectors that may occur in the region should be realized, according to the data presented in the diagnosis carried out. Along with the activities of Environmental Education, with the programs of Public Health and Use of the Reservoir's Surroundings, activities of prevention and control of diseases and infestation vectors should be developed. Besides, the data about the occurrence of hematophagous bats should be monitored, seeking to map the populations and to inform the State's Health and Agriculture Secretaries, as agreed in meeting with the Centro de Vigilância em Saúde do Rio Grande do Sul (Center of Health Vigilance of the State of Rio Grande do Sul).

Current situation:

The program started in the beginning of spring, 2009. In that phase, samplings of every monitored faunal group (entomofauna, herpetofauna, ornitofauna and mastofauna) were carried out. The methodology applied is in accordance with the requirements established in the PBA and in the conditions presented to the operation license renewal.

Quarterly campaigns were performed during from 2009 to 2012, including the four groups, as presented below:

- Insects: Seven field surveys and wildlife monitoring were performed, concerning arthropods of medical interested, which were collected from four sampling stations. The collections were realized in both the day and night period, using human bait. All specimens were treated and stored in entomological boxes, composing a private collection, under the responsibility of the technical group monitoring the wildlife. During the seven campaigns, 502 specimens were collected, from 10 different genders, from which 16 species originated from the same gender. The genders *Culex* and *Wyeomyia* represent the larger quantity, totaling 55% of the insects collected. Three specimens of major vector of the yellow fever were found, along with two specimens of secondary vector of leishmaniasis. For this reason, it was recommended the study of the presence of these medical interest organisms, focusing on the three species already observed, aiming to understand why they were only present in the last collection.
- Amphibians: Ten campaigns were performed in the period after the filling, regarding amphibians monitoring. The registers were based in visual encounters in both day and night periods and also by listening methods. During the campaigns, 25 species of anuran amphibians were cataloged, representing eight different families. The greater diversity was observed during the warm period (spring). The curves of species accumulation presented a small tendency to stabilization, in comparison with the situation before the project's implementation. Only three species were considered most affected by the reservoir filling (*Limnomedusa macroglossa, Vitreorana uranoscopa, Lithobates catesbeianus).* Further monitoring of those species should be realized, six times per year.
- Reptile: Ten campaigns were performed between the springs of 2009 and 2012, in order to observe climatological changes effects on the presence of reptile specimens around the reservoir area. The sampling was carried out in areas close to the accesses, to the reservoir and to the points considered of interest for the reptile wildlife. The main method used for registration was active search and the sampled areas were searched randomly. During the ten campaigns, 14 species were cataloged. The accumulation curve of species was stable after the sixth campaign, suggesting a real knowledge of the area biodiversity in the current stage. The monitoring activities have indicated that typical species of tropical forests remain at the location and there is no indication of population reduction. Among the species cataloged, four have been more present in the samplings, specially the *Tupinambis merianae* - a lazard with over 60% of appearance. He is followed by the snakes *Atractus paraguayensis*, *Bothropoides neuwiedi, Thamnodynastes strigatus.* Overall, species more adapted to anthropogenic environments presented a higher frequency in the campaigns. However, more demanding species have also been noted in both

phases of the study. It is important to observe that there is one aquatic specie of special interest, the *Phrynops williamsi*, observed in two occasions after the filling. It has very selective habits and it is historicallt considered a very sensitive species regarding hydroelectric projects, because the changes in the in the habitat. Monitoring should continue to be performed, twice a year, preferably in period with high temperatures and solar irradiation.

- Avifauna: 14 campaigns were performed since the reservoir filling in four selected spots. The presence of species observed by building a list of species in each campaign and calculating the frequency of them in all campaigns realized. The region updated avifauna list contains 248 species. Of this total, 14 were registered only before the filling. Those species are more sensitive to environmental changes and seem to have suffered from the short-term impacts related to the reservoir's filling. Other species that are no longer being observed in the after filling monitoring can be suffering for other kinds of mid-term impacts. However, those losses are harder to analyze, because many other factor can influence the birds habits in the region. From the total of obtained species, 25 are considered vulnerable, in danger and in severe danger. From the other 234 species, 75 were noticed in almost all campaigns and are considered very frequent. 29 were considered frequent, 35 uncommon and 58 rare or occasional. The results seem to arise from a combination between the impact from the filling and other factor, such as the use of the regional areas for a series of purposes. Moreover, macro trends for the region, such as the isolation of forest patches in agricultural matrix should not be discarded. If monitoring continues to go on, it is probable that other species will be added to the list and other can be observed again. However, those registers are punctual and should not influence in a significant matter the continuation of the monitoring.

- Terrestrial mammals: Seven campaigns were performed, between October 2009 and November 2012. The sampling of mammals was realized in two places, denominated Trail A and Trail B. The search for vestiges was carried out both in the day and in the night period, by foot and by car. Footprints and possible shelters were observed. Visual records were also considered. The monitoring registerd 35 *taxa*, distributed in eight different orders and sixteen families, from which two are introduced *Mus musculus* e *Lepus europaeus*. The species accumulation curve indicates a stabilization tendency after the fifth campaign, what corresponds to beginning of monitoring after the filling period. Considering the richness obtained in each campaign throughout the monitoring, it is observed a medium reduction of 50% during the six campaigns. Considering only the after filling phase, about 70% of the registered *taxa* presented a low registration frequency, observed eventually. The vegetation removal from the implementation phase led to drastic changes in some of the remnant populations, resulting in the increase of species to environments available according to their resilience. Hunting probably plays the major role regulating current population in this community, what leads those vulnerable species to a significant decline, especially the medium and large sized. It is concluded that permanent and intensified supervision is needed, aiming not only to reduce the hunting pressure, but also to guarantee that the forests adjacent to the reservoir slope, which constitute the main places of refuge, remain relatively well preserved, not being degraded by anthropic use. The impacts seem to be caused mostly by the actions of others than by the HPP Alzir dos Santos Antunes.

- Chiropterans (bats): Three points were determined to study the occurrence of bats in the region, the first one at the left margin and the other two at the right margin. Seven monitoring campaigns were carried out and 227 specimens were registered, from 10 different species and two families: Phyllostomidae (predominant) and Vespertilionidae. It was not possible to observe the stabilization of the species accumulation curve, but only 20% of the species estimated for the area were registered in the monitoring procedures. It is possible that this stabilization will only occurs with a greater sampling effort. However, considering the data gathered until present moment and the efforts already made in monitoring, it is probable that further monitoring would only add other six or seven species to the registrations, not completely associated with the impacts that HPP Alzir dos Santos Antunes may have caused.

The following images (FIGURE F.12) present some of the species observed during fauna monitoring:

Hypsiboas albopunctatus

Lithobates catesbeianus

Atractus paraguayensis

Anisolepis grilli

Leopardus tigrinus

Lepus europaeus

Sturnira lilium

Artibeus lituratus

FIGURE F.12: *Examples of animals found during monitoring.*

Conclusion:

According to the results from the field surveys conducted until the end of 2012, some groups of species should continue to be monitored:

- Insects: Semiannual campaigns, for five days each, during two years (2013-2014), to observe the presence of the mentioned disease vectors (*Haemagogus leucocelaenus, Lutzomyia shannoni and Lutzomyia intermedia).*
- Amphibians: Quarterly campaigns, during two days for species (*Limnomedusa macroglossa*, *Lithobates catesbeianus e Vitreorana uranoscopa),* totaling six days each campaign, during three years (2013, 2014, 2015).
- Reptile: Semiannual campaigns, six days per year, specifically for the *Phrynops williamsi*) for two years.

It is noteworthy that Monel, within the routines of survey / inspection in reservoir management and the agreement signed with the Environmental Police, has served both in the environmental education of coastal residents, as in restraint of hunting in areas of APP and overfishing in the reservoir.

The environmental impact will continue to be addressed.

14) RESCUE AND MONITORING OF THE ICHTHYIC FAUNA (PERMANENT)

Description:

The program was created in order to observe changes in the ichthyic fauna resultant from the modifications in the aquatic environment, due to the reservoir existence. The program is subdivided into monitoring of the fish community and monitoring of migrating fish. The study of both communities helps understanding how the fish have behaved in the Passo Fundo River and its tributaries, considering the before and after filling periods.

Current situation:

Two different companies, one at 2008 and the other by mid-2012, executed the study. Six sampling points were considered for the fish communities (P1 – P6) and three for the ichthyoplankton (P2, P5, P6). FIGURE F.13 presents all six points.

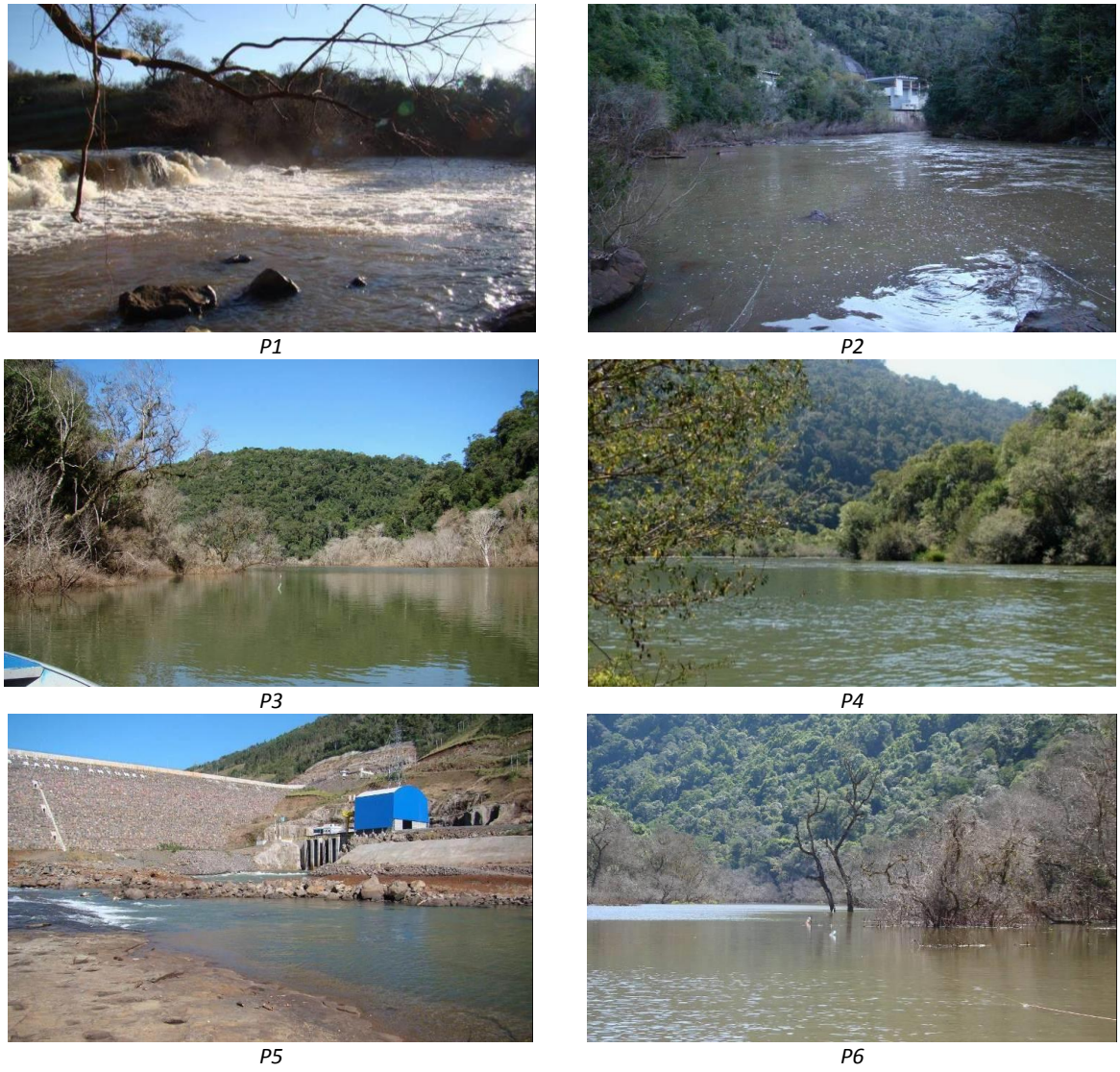
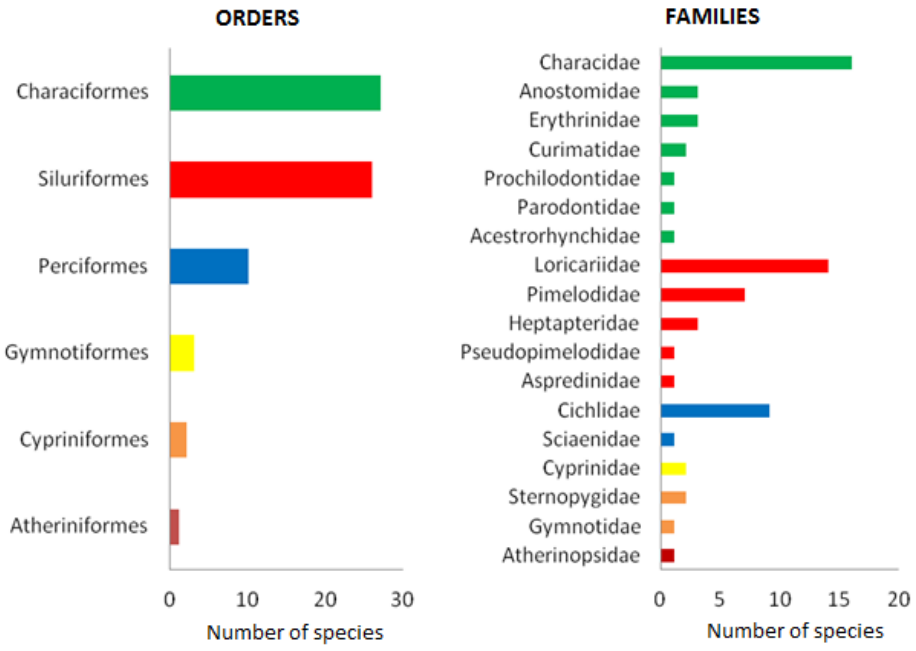


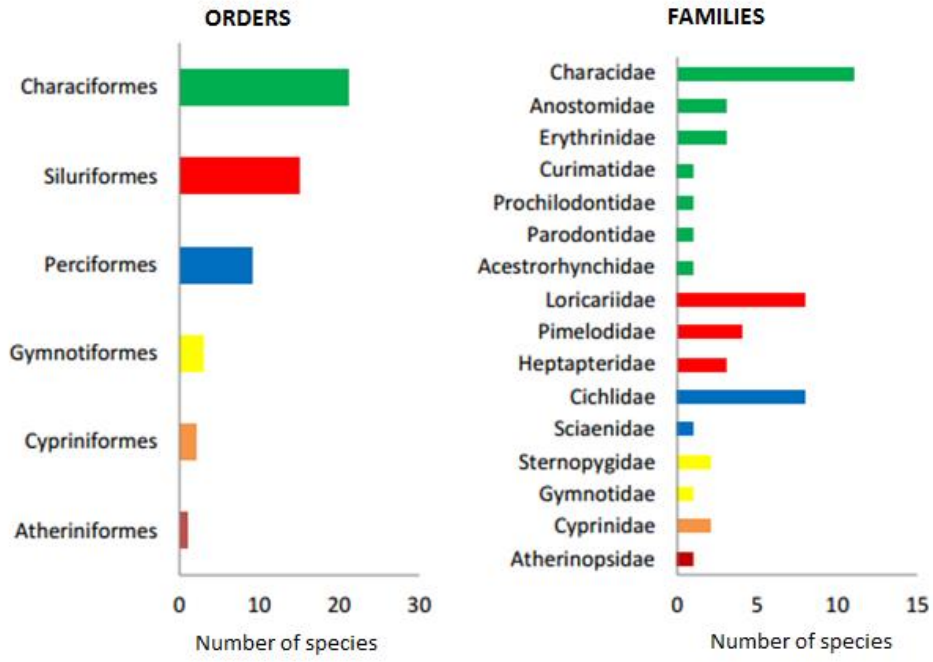
FIGURE F.13: *Six points determined for the ichthyic fauna monitoring.*

The monitoring of migratory fish have been performed since June 2008, aiming at evaluating their displacements and habitat use, by using radio telemetry techniques. The program has two radio telemetry fixed stations, one downstream of HPP Alzir dos Santos Antunes and another is located at the power house of HPP Passo Fundo. In addition, mobile tracking of the fish released upstream the reservoir is also performed.

By the end of 2012, 69 species have been captured, of 17 different families and 6 orders. Most of the undefined species belong to small *taxas*, smaller than 25 cm and are exclusive of river environments. Monitoring results from 2013 presented 51 species from 16 families and 6 orders. FIGURE F.14 BRINGS a comparison between the families found at the two periods mentioned.



(a) Results from 2008-2012.



(b) Results from 2013.

FIGURE F.14: *Comparison of species captured in the monitoring period from 2008-2012 (a) and 2013 (b).*

Significant differences were observed after and before the reservoir filling. The highest values for the pre-filling period were found at point 2 (summer of 2008) and the lowest at point 4 (summer of 2009). In the

post-filling period, the highest value occurred at point 5 (summer 2012) and the lowest at point 2 (spring 2009).

The only species observed in both periods was the *Hypostomus isbrueckeri*. Some species considered frequent inside the reservoir before the filling became accidental in the period after the filling. Dominance of ten species was observed during 2012 (*Astyanax* sp., *Acestrorhynchus pantaneiro*, *Steindachenerina brevipinna*, *Hypostomus isbrueckeri*, *Astyanax* sp., *Astyanax jacuhiensis, Schizodon nasutus*, *Leporinus amae*, *Oligosarcus oligolepis* e *Astyanax* sp.). Six long-distance species were captured and exotic species were also observed. The most reasonable explanation is that they might have escaped from tanks from fishing activities in the region.

In August 2012 the first ichthyoplankton was performed and only one larva of *Odontesthes perugiae* was captured at point 2. In the three campaigns performed in 2013, two larvas of the same species were captured.

FIGURE F.15 presents examples of species captured during monitoring.

Leporinus amae

Hypostomus isbrueckeri

FIGURE F.15: *Examples of fish captured at monitoring.*

All data are available for consultation at MONEL's environmental reports.

Conclusion:

The fish fauna can be considered the main animal community affected at the occurrence of a hydroelectric project, since construction of the dam results in the diversion of river stretches. Therefore, monitoring should be continuous in order to observe major changes in species and their reproductive cycles. Thus, the processes of recovery and release can be accomplished more easily in the occurrence of species trapped, among other factors. Constant monitoring enables the mitigation of the impact and is therefore a permanent program.

The impact is being constantly monitored and addressed.

15) RELOCATION OF AFFECTED POPULATION (CONCLUDED)

Description:

The program was created to support 55 families directly affected by the entrepreneurship. Most of them meet a social profile consistent with the outskirts, allocated next to the Rio Passo Fundo. There were no

tradition regarding agricultural production and farming and the population had low market and urban labor expectations. The families' incomes came from an informal market, what made difficult for them the supply of the basic needs. For that reason, most of them had a strong dependence of social programs, such as *Bolsa Família*[33]*, Cesta Básica*[34], etc.

The criteria used in the relocation program is described in Agreement signed in May 2003, between the entrepreneur and the commission of people affected by HPP Alzir dos Santos Antunes (from Portuguese, *Comissão da População Afetada pela Hidrelétrica Monjolinho*), which represents the affected population since the begging of the project implementation. The document is available for consultation (*Termo de Acordo Remanejamento dos Atingidos.pdf*), as well as each individual agreement.

Current situation:

From 55 families relocated, the majority was composed by individuals that did not own any land or individuals that owned small land (smaller than 5 hectares). From this total, 21 families (38%) have chosen the especial urban relocation[35] and 34 families (62%) have chosen the rural relocation.

A. SPECIAL URBAN RELOCATION:

The situation of the 21 families that chose the special urban relocation option is the following:

- Thirteen continued to live in the properties provided by MONEL;
- Four had rented their properties to others and went back living with family for the following reasons: separation, health problems, being single and apart from family, etc.
- One who shared the benefit with the first wife and after the separation process lost the house.
- Two families sold their houses, one of them because of death.

Most of the families that stayed in the properties had not only retirement and pensions as income generation, but access to new opportunities in the urban labor market. The situation served as an incentive for those who sought career opportunities.

A support network emerged in each one of those families' lives, in the form of relatives, neighbors, church, schools, health care center, etc. It contributed to adapt to the new reality. For this reason, **MONEL understand that these families are completely emancipated under the social and economic point of view, what means that program's goals have been completely fulfilled.**

FIGURE F.16 presents examples of before and after situations.

[33] Bolsa Família is a program of direct transfer of income that benefits families in poverty and extreme poverty across the country. The Family Plan includes the Brazil without Poverty, which has its focus on the millions of Brazilians with per capita income below R $ 77 monthly and is based on income security, productive inclusion and access to public services.

[34] Cesta básica (basket) is the name given to a set consisting of products used by a family for a month. This set usually has foodstuffs, personal hygiene and cleaning products.

[35] According to the agreement, the beneficiaries of the especial urban relocation are individuals over 60 years old, that compose a basic family unity and that are economically independent and develop farming activities or; alone individuals or family unities with limitations in their agricultural productive capacity and/or with extraordinary characteristics.


Before and after of Catarina Sampaio house.


Before and after of João Otávio house.


Before and after of Neiva Mulinetti house.

FIGURE F.16: *Examples of before and after situations of special urban relocation.*

B. RURAL RELOCATION

From the 32 families that have chosen to participate in the rural relocation modality, five do not live in the property anymore. Four of which have been sold. The twenty-seven families left still live in their homes, with the following conditions:

b.1) Production System

Activities are diverse, but not specialized. 80% of the families produce traditional grains, such as corn, beans and soil. About 80% presented improvement in livestock farming. Almost all the families (95%) own dairy cattle and some commercialize dairy products. Aviculture activities are performed by 98% of the families, but most of them for internal consumption. 20% commercialize eggs for income complementing purposes.

b.2) Property Management

The main reasons that hinder the property management are the unfamiliarity of the land productivity techniques, the lack of technical assistance and, for some, a low education level.

b.3) Technical Assistance

98% of the families informed the lack of technical assistance and 100% feel the need of further guidance to improve the production and use of their lands. For this reason, MONEL has provided technical assistance services until August 2013. The company Stibuski&Stibuski is responsible for that activity. The results can be consulted at document *Relatório de Assistência Técnica aos Reassentados da UHE Monjolinho2012.pdf* and at the quarterly reports sent to FEPAM up to the date. The latest visits of the technical assistance team covered the following items:

- Genetic improvement of the livestock through fertilization;
- Indicating mineral salt for cattle consumption;
- Indicating vaccines against anthrax and brucellosis;
- Indicating grazing lands improvements;
- Implementing green fertilization;
- Indications of how to proceed soil analysis;
- Implementation of orchards and vegetables;
- General guidance on how to take care of the environment;
- Referrals to the city halls.

b.4) Credit Lines

Only 10% of the families had access to a credit line. The cause of those who did not were many, being the apprehension of being involved with financial institutions the most common.

b.5) Land Lease

The land lease for other represents 20% of the supplementary income of the families that do not have enough financial resources to exploit them.

b.6) Associations

Approximately 40% of the families are registered in the rural syndicates and 12% in regional cooperatives. The other (48%) do not participate in any kind of association.

b.7) Health and Education

100% of the families have children in school age and also adults registered and going to public schools or youth and adults educations programs. All of them have school transportation available. They also have access to health care and they get health assistance by SUS[36]. A few present hypertension or heart diseases.

b.8) Income

[36] From Portuguese *Sistema Único de Saúde*. It is the health care system provided by the federal government.

Almost 34% of the families declare a monthly income from 1.5 – 3 salaries[37], coming from the selling of milk, cheese, registered works, other properties, retirement and pensions. The other 66% declare to receive a monthly income of one minimum wage and for that, they are beneficiaries of the government assistance program "Bolsa Família".

b.9) Level of Satisfaction with the Property

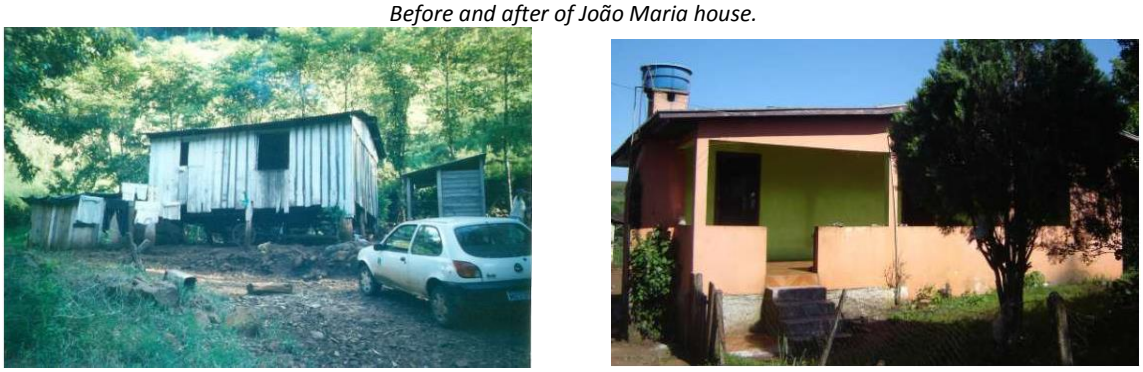
95% of the families are satisfied with their new properties. The other 5% claim to be unsatisfied due to the wish to live in the city.

b.10) Social Relations

At least 95% of the families have positive interactions with their neighbors and the community in general, what facilitates adapting to the new reality.

FIGURE F.17 presents examples of before and after situations of those who chose the rural relocation modality.

Before and after of João Maria house.



Before and after of Valdemir de Souza house.

[37] Currently, the minimum wage in Brazil is R$ 724.

Before and after of Osório Family house.

FIGURE F.17: *Examples of before and after situations of special urban relocation.*

Conclusion:

Although it can be considered a huge impact in hydroelectric entrepreneurships, the population relocation due to HPP Alzir dos Santos Antunes construction was performed successfully. It is important to remember that the 55 families were not in a strong tradition scenario and the great majority survived from government assistance programs and did not have significant economic activity before the relocation. MONEL has sufficiently provided conditions to resettlement at communities located at the same region and it has also monitored and assisted the families until August 2013, to guarantee that they were secure to move forward by themselves.

Therefore, the impact has been addressed and the program is concluded.

16) RESTRUCTURING OF THE SITE AND INFRASTRUCTURE (CONCLUDED)

Description:

The program was created in order to mitigate the impact caused by the changes in the infrastructure. A part of the road and the bridge that connects Nonoai and Faxinalzinho should be submerged after the HPP Alzir dos Santos Antunes reservoir filling. For that reason, the access road between those cities should be deviated over the HPP dam, resulting in a reduction of traffic on Erechim road. Those changes affect the daily life of the population nearby, specially those formerly dependent on the Erechim road. However, those changes may also bring improvement in the population life, which will be able to traffic in more appropriate roads.

Current situation:

The program was implemented at the construction phase and is already concluded.

The following actions were developed in this program:

- After the construction of the dam, the connection between the cities of Nonoai and Faxinalzinho began to be realized by the dam crest.
- In the location close to the bridge, some of the 80 families were relocated (please see Item 12 – Relocation of Affected Population).
- After the filling, the bus line continued to meet the population's needs, by offering services at two times along the day: in the morning and in the afternoon.

There were no damages to local population, regarding transportation. There was no need for intervention in any other road or access.

Conclusion:

The impact has been addressed and the program was concluded.

17) ACCIDENT PREVENTION AND PUBLIC HEALTH PROGRAM

Description:

This program has the following objectives:

- To elaborate a system of epidemiologic vigilance, centered in the prevention of the introduction and control of existing vectors;
- To elaborate a program of worker's health, aiming at the workers in the site and the population involved, avoiding aggravations and permitting a better quality of life and;
- To structure mechanisms of prevention of accidents with venomous animals, notably in the phases of deforestation, detour of the river and filling of the reservoir.

The following environmental indicators should be used:

- The profile of hospital morbidity;
- The profile of mortality, notably in groups of infectious-parasite, causes of the respiratory system and external;
- The prevalence of cases of accidents with venomous animals; (iii) the prevalence of endemic diseases or of compulsory notification.

The workers admission and resignation exam, as well as periodic health tests adopted by the companies working in the implantation of the entrepreneurship, should constitute indicators of the program in the sphere of the worker's health.

Current situation:

The Program was initiated on August 2007 and was developed during the plant's implementation. It was concluded on December 2009, as projected. The Health and Safety Issues are currently addressed by the Environmental Management Program.

Conclusion:

The impacts have been prevented and are still constantly addressed by the entrepreneur's environmental policy.

18) PROGRAM OF ADEQUACY IN TRAFFIC CONDITIONS

Description:

To satisfy the necessities of adequate roads to the traffic demanded by the development of the building site, it was necessary to execute improvement in the roads that give access to the site, in special the interval of 7 km, which should connect Nonoai to the construction site, with rectifications of design, adequacy to the draining system and signalizations.

This improvement should be executed in all the roads that would receive the traffic from the site, considering the increase in the flow, which should last during the construction period. The alterations in the traffic should be considered under the aspect of increase in the road and urban traffic. The increase in the road traffic should reflect in the amplification of the flow of vehicles in the roads RS-480 and RS-486 and in the road that connects Nonoai to Faxinalzinho, which structures the region of the entrepreneurship`s implantation. This increase in the traffic should be due to the mobilization of equipment, transport of materials and of people allocated in the site, being represented by heavy and light vehicles, it should be expected an increase in the intensity in the zones near the dam, mainly due to the transport of clayey soils, sand and crushed rock.

The aspect of urban traffic intensification should probably occur in the city of Nonoai, once a considerable amount of the economical movement coming from the construction site will be concentrated in its surroundings.

Current situation:

The Program was initiated on November 2007 and it was developed during the implementation phase. It was concluded in December 2009, as projected.

Conclusion:

The program was concluded as projected and improvements were executed in the predicted roads. The impact has been addressed.

19) UTILIZATION OF LOCAL LABOR PROGRAM

Description:

The program consists of a potentiating measure of the impact job creation. It should assure that the local population benefits from the entrepreneurship, by enlarging the labor market, as well as providing organization and qualification of the productive capacity of the influence region of HPP Alzir dos Santos Antunes.

The program had the following goals:

- Providing technical support to local city halls so that they could adapt to the changes resultant from the plant's construction, adapting their infrastructure to deal with the local labor.
- Providing information services regarding offer and demand of jobs in the entrepreneurship.
- Organizing the reception of those attracted to the region because of the jobs offer, without interfering with the city halls infrastructure.
- Establishing partnerships with the Public Power and other organizations, aiming at registering and training local labor through professional capacitating courses.

The program's targets were to registers all interested in the jobs, use the most of the local labor and proceed the training of all those interested and registered.

Conclusion:

The program was carried out during the project implementation and has been successfully executed.

The impact has been potentiated.

20) SUPPORT TO THE INDIGENOUS COMPONENT (ONGOIG)

Description:

There are five indigenous lands located in the Rio Passo Fundo River basin – T.I. Nonoai, T.I. Rio da Várzea, T.I. Votouro, T.I. Guarani-Votouro and T.I. Serrinha, corresponding to a population of about 5,000 indigenous. According to FUNAI, they are distributed between Kaingang and Guarani ethnic groups, occupying a total area of 52,253 ha, representing an indigenous population density of 9.6/km².

At the time of the HPP Alzir dos Santos Antunes environmental study, it was concluded that four indigenous lands could be suffer direct influence from the project implementation: T.I Nonoai, T.I. Rio da Várzea, T.I. Votouro and T.I. Guarani-Votouro. Among them, T.I. Nonoai is the closest to the plants, located at the left margin of Passo Fundo River, in Nonoai city.

By the time HPP Alzir dos Santos Antunes was requesting the implementation license, some discussions regarding the indigenous tribes were brought up. However, the conflict was resolved by the creation of a Term of Agreement and Commitment, signed by MONEL and FEPAM, in August 4, 2004, as request by the city halls of the municipalities involved and also by the CIAHM. The agreement granted FEPAM the exclusive jurisdiction to deal with indigenous issues directly with MONEL.

It was established the activities related to the support to the indigenous component should be performed under coordination of FUNAI, the National Foundation of the Indigenous (from Portuguese, *Fundação Nacional do Índio*) and all technicians should be assigned by it. The activities should follow the term of reference developed by FUNAI and sent to FEPAM under the number 104/CNAM/CGPIMA/04, from June 9, 2004, which consisted of a deep diagnostic study of the ethno-ecological issues of the indigenous lands within the entrepreneurship. The term of reference defines the goals, methodology, coverage area, activities, targets and results expected of the specific activities that should be carried out. The document is available for consultation.

A second term of commitment was signed in December 14, 2009, between MONEL, FUNAI and the mentioned indigenous tribes, aiming at a guarantee of the implementation of the mitigating measures predicted at the time of the project implementation.

The term determines the commitments and activities that MONEL should develop regarding the indigenous component of HPP Alzir dos Santos Antunes, previously defined by the time of the EIA and the PBA, in the form of four programs and 8 sub-programs. The activities started in December 2009, when the first budget was transferred, following the established in Paragraph 6th of the first Clause.

Current situation:

On March 3, 2010, the first meeting between MONEL, FUNAI and representatives of the indigenous tribes was held and at the occasion, the participants of the Management Committee were selected. The Committee should be in charge of keeping up with the implementation of the programs. The Committee has also determined which activities should be priority, described as follows:

A. ADMINISTRATIVE MANAGEMENT PROGRAM

a.1) Monitoring and Management Subprogram

The subprogram priority was to create the main center of management and monitoring, called "Management Committee". Its main goal should be the appropriate management of the implementation of the activities presented in the PBA.

At the Committee's third meeting, the indigenous communities Nonoai, Kandóia and Rio da Várzea have declined their participation in the group. After June 2010, a series of internal disputes between leaderships of the indigenous communities was noticed, and, for this reason, the FUNAI representative from Passo Fundo, Mr. Marcelo Zeni, along with the Regional Administrator in Passo Fundo, Mr. Adir Reginato, requested that the MONEL representatives temporarily suspended all the activities that depended on the communication with the tribes, including field works and the Management Committee meetings. These measures were taken in order to avoid complications in the conflicts.

Among the social communication actions, the development of specific informative material on the Management Committee can be highlighted. In addition, MONEL representatives have visited some tribes and they have visited HPP Alzir dos Santos Antunes in order to clarify any questions related to the relationship between MONEL, FUNAI and the indigenous communities.

a.2) Institutional Strengthening Subprogram

The Commitment Term established that five computers should be donated to the Votouro Kaingang community, two computers to the Guarani Votouro community and fifteen to the Nonoai community (tribes Bananeiras, Pinhalzinho e Sede).

Administrative kits containg office material and furniture (cabinets, archives, chairs, cameras, printers and others) were delivered to the communities Guarani Votouro, Votouro Kaingang and Nonoai (FIGURE F.18).

Delivery of the kits for Votouro Kaingang

Delivery of kits for Nonoai

FIGURE F.18: *Registers of the delivery of the kits and computers to the indigenous communities.*

B. TERRITORIAL MANAGEMENT PROGRAM

b.1) Territorial Mapping and Planning Subprogram

This program started in 2010 and it consisted of the development of the land use and occupation map of the indigenous lands Votouro Kaingang, Guarani Votouro, Nonoai and Rio da Várzea. The mapping was

performed based on satellite images. Because FUNAI suspended the activities relating to the indigenous communities (as mentioned above), the program returned in 2011.

Complementary field surveys were executed in 2012 to the delimitation of crops, grazing land and permanent preservation areas in the land of Votouro Kaingang and Guarani Votouro communities. The land use and occupation map for both communities was then concluded.

All the maps are in Portuguese and, for this reason, were not included in this section. However, they are available for consultation.

C. Environmental Appreciation Program

c.1) Forestry Recovery and Management Subprogram

The activities of this program were defined in the Management Committee second meeting, in May 2010. It determined the training of indigenous in seedlings production and planting and in the reforestation of riparian areas and ecologic corridors. Both training were applied to the Votouro Kaingang, Guarani Votouro and Nonoai communities. The areas to implement the reforestation and planting activities were determined by the land use and occupation map developed by the territorial management program.

Evidence of the trainings are available for consultation (total 32 participants, 40 hours). FIGURE F.19 presents registers of the training.

Course of seeds collection – Votouro Kaingang.

Course of seedlings production and preparation – Rio da Várzea.

***FIGURE F.19:** Registers of the delivery of the kits and computers to the indigenous communities.*

For the students of 2013 and 2014, 163,000 seedlings were provided, from which 85,000 for Votouro Kaingang, 41,500 for Guarani Votouro and 36,000 for Nonoai. In October 2012, the Votouro Kaingang and Guarani Votouro communities required the trading of 2,762 native species seedlings, which should be planted according to the subprogram, for fruit species. The planting was assisted by a technical team provided by MONEL (FIGURE F.20).

FIGURE F.20: Registers of the delivery of the fruit species seedlings to Nonoai community.

c.2) Water Resources Management Subprogram

The diagnosis of the dams located at Votouro Kaingnag and Guarani Votouro lands was performed in July 2012 and concluded in August 2012. Two dams in need for improvement, such as increase of depth and modifications in the slopes, were mapped in the Guarani Votouro lands.

13 dams were ready for immediate restocking in Votouro Kaingang community (FIGURE F.21). The rest required environmental licensing in order to execute the improvement measures, but at last, FUNAI was held responsible and proceeded with the activities.

FIGURE F.21: Registers of two dams ready for repopulation in Votouro Kaingang community.

Fish farming training was also offered as part of this subprogram. In 2012, 12 students of Votouro Kaingang community have participated in the course. The restockingn performed in November 2012 in the 13 dams of Votouro Kaingang (FIGURE F.22) community totaled the introduction of 166,250 fingerlings (1/3 of catfish and 2/3 of carps).

FIGURE F.22: Registers of the restocking of the dams in Votouro Kaingang community.

c.3) Environmental Education Subprogram

This program consists of the Environmental Program described earlier in item 9.

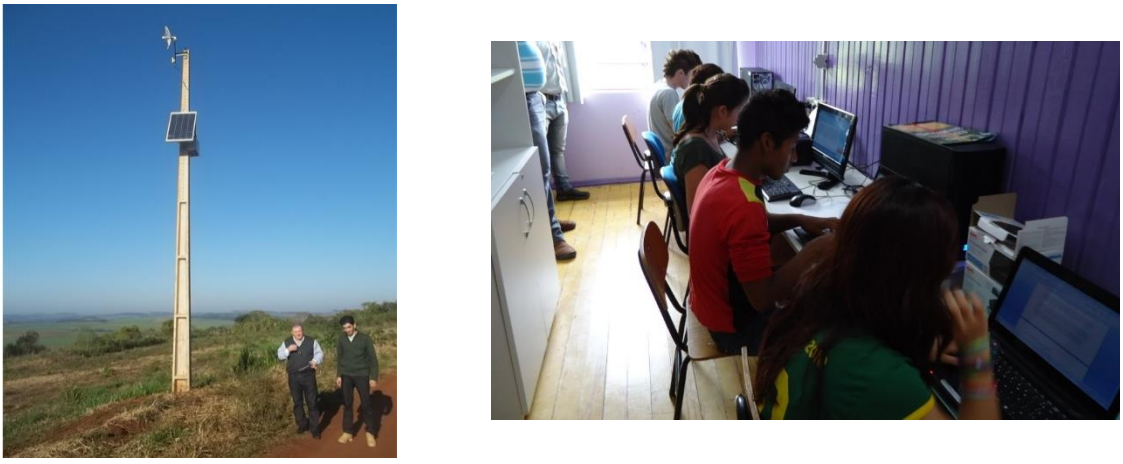
D. SOCIAL AND ENVIRONMENTAL STRENGTHENING PROGRAM

d.1) Social Inclusion Subprogram

The Committee has defined as priority the activities regarding a digital inclusion program among the indigenous lands. In 2011, activities regarding internet services and equipment installation in the Votouro Kaingang, Guarani Votouro and Nonoai communities began to be organized. In May 2012, FUNAI has authorized the installation and the works of digital inclusion were concluded.

Three training courses in basic computer skills for the youth were scheduled for Nonoai community, one for Votouro Kaingang and one for Guarani Votouro. They were all executed in 2012 and, in a three-month period and a total of 23 students have participated.

Registers of the program are presented in FIGURE F.23.



(a) *(b)*

FIGURE F.23: *Digital inclusion activities: (a) signal capturing equipment; (b) basic computer skills courses in Guarani Votouro community.*

Other priority action of the subprogram was the Sports Encouragement, which established the construction of the sports court coverage of Toldo Coroado Scholl in Votouro Kaingang community and the implementation of a soccer field in Guarani Votouro community. The improvement project started in 2010 and included not only the coverage, but also the construction of bleaches, stage, toilets and bar. The sports court was ready by April 20, 2013 (FIGURE F.24).

FIGURE F.24: Inauguration of the sports court at Votouro Kaingang community, in April 2013.

The social inclusion program also included the support to indigenous women. Ten training courses were provided, in the following areas: cooking, clothing and hygiene. The community chose the themes and they were executed until January 2013 (FIGURE F.25).

FIGURE F.25: Cooking courses performed in the indigenous communities.

c.2) Job and Income Generation Subprogram

The priority activities defined for this program were:

- Support to the production costs;
- Support to the production infrastructure;
- Hiring of indigenous for seedlings planting and production;
- Providing appropriate technical assistance.

According to the Commitment Term, MONEL has been transferring to the Votouro Kaingang and Guarani Votouro funding regarding the **support to production costs**. Until December 2012, the total funding reached R$ 453,653.72. In June 2013, other R$ 89,600.00 were transferred. Regarding the **support to the production infrastructure**, the equipment was furnished by MONEL in 2010.

In 2012, after the activities of the land use and occupation mapping were finished, the areas for future implementation of grazing land and crops in each community were identified, as follows: 269.65 ha in Votouro Kaingang and 33.18 ha in Guarani Votouro. The first produces grains, specially soil, corn and wheat. The second produces corn and livestock.

Regarding the **hiring of indigenous for seedlings planting and production**, the action is associated with the Forestry Recovery and Management Subprogram. And last, the **technical assistance** has been

executed by a hired company (Stibuski&Stibuski). Registers of the activities mentioned are presented in FIGURE F.26.

Support to the production infrastructure – Equipment delivery

Providing appropriate technical assistance

FIGURE F.26: *Registers of activities from the Job and Income Generation Subprogram.*

Conclusion:

The support to the indigenous activities have been executed as previewed in the PBA, except for the period when they had to be paralyzed as required by FUNAI. MONEL has delivered everything as promised and it can be observed that the program is effective. All the minutes from the Management Committee are available for consultation, as well as the quarterly reports sent to FEPAM. For this reason, the impact has been addressed and the program it is still ongoing.

21) CONSERVATION AND USE OF THE WATERS AND THEIR SURROUNDINGS PROGRAM (PERMANENT)

Description:

This program was created to organize the anthropic use of the reservoir and its surroundings, in accordance with applicable legislation and operational and safety standards. This was possible due to the development of an Environmental Zoning (EZ) proposal, which should be approved by the environmental agency. This EZ should also help developing the Master Plan of the municipalities.

For effect of this plan, the HPP Alzir dos Santos Antunes influence area comprehends a range of 1,000m around the reservoir, divided in four categories:

- Reservoir;
- Permanent Preservation Area (APP);

- Excerpts of Consolidated Use; and;
- Transaction Zone (composed by the 1,000m range above the flooding line).

The proposal of environmental zoning contemplates the reservoir and the variable range of the APP, with width of 30m. The categories were classified considering the environmental characteristics, associated with the consolidated uses. After the unities were defined, each one received a unique description and suggested resctrictions of use, as follows:

The reservoir has been divided in two zoning categories:

- Reservoir Safety Zone: stretch located immediately upstream and downstream the HPP dam. It corresponds to the passage in which people access is strictly controlled, aiming at security of the energy generation systems, as well as the users of the reservoir. Upstream the dam, signalized log boons can be found and the upstream is signalized.
- Pollutant Emissions Controlling Zone: corresponds to the sections located along with the tributaries that receive load of organic matter from the pollution points identified at the basin.
- Potential Use of the Reservoir Zone: are of the reservoir where possible activities are carried out by third parties, like sport fishing, leisure activities and watering livestock.

The permanent preservation area was divided into the following zones:

- Permanent Preservation Zone: composed by the band of riparian protection acquired by the entrepreneur that forms the permanent preservation area of the reservoir. It is intended for full preservation.
- Touristic Use and Interest Zone: composed by the consolidated or potential touristic sights and leisure areas inside the permanent preservation area of HPP Alzir dos Santos Antunes.

Current Situation:

MONEL has been developing a series of activities, among its responsibilities according to the environmental plan. From 2009 to 2012 the following activities were performed:

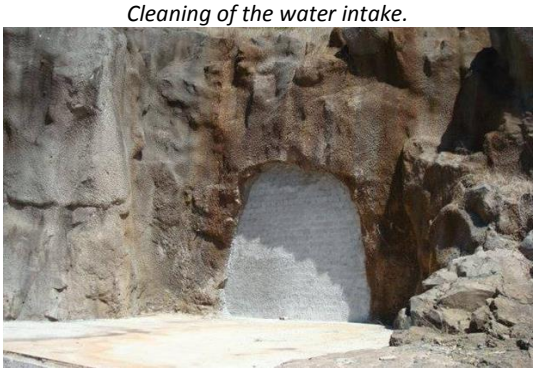
- All the zones go over frequent surveillance, to assure that no illicit hunting or fishing is occurring, as well as bathing in the reservoir. The bathing is prohibited due to the lake's depth, associated with a very sharp relief at its bottom. These factors endanger the life of those who attempt to bath in the reservoir's waters.
- When necessary, the maintenance and cleaning of the floating material of the reservoir are performed, to guarantee the health of the environment and the safety of the users.
- In 2010, advertising signs were located along the reservoir.
- In 2011, fences and a gate were installed in the permanent preservation area. This measure was implemented to avoid the irregular use of the margins and the direct access to the lake, because of its dangers to human life, due to the lake's depth.
- In 2011, safety measures were applied to the right margin of the reservoir, close to the dam, by the implementation of fences, a layer of ravel and the closing of the tunnel located next to the power house.

- During the drought of 2011, in December, a siphon with 20m of length and diameter of 150mm was installed near the right abutment of the spillway, aiming at the renewal of the accumulated water and also avoiding the proliferation of insects and larvae.

FIGURE F.27 presents registers of the activities mentioned above.

Cleaning of the water intake.

Installation of fences in the APP.



Closing of the service tunnel.

Installation of siphon in the spillway.

FIGURE F.27: *Registers of the activities carried out in the conservation and use of the waters and their surroundings program.*

The activities of the program continue to be executed. Whenever there are infractions regarding trespassing, illicit hunting and fishing, the Police is informed. FIGURE F.28 presents situations where transgressors were apprehended.

Illicit fishing apprehension.

Illicit hunting apprehension.

FIGURE F.28: *Apprehensions in the conservation and use of the waters and their surroundings program.*

Conclusion:

MONEL has been successfully implementing the measures previewed by the conservation and use of the waters and their surroundings program in the areas of its responsibility, among maintenance and conservation of APP, surveillance, signaling and others.

The program is permanent and monitoring will continue.

The impact has been addressed.

22) ENVIRONMENTAL PLAN FOR THE CONSTRUCTION – EPC (CONLUDED)

Description:

During all entrepreneurship's implementation process, sub-hired companies should be oriented to adopt techniques which consider the best engineering solutions, aiming at the environmental protection. Activities of this program should support to sub-hired companies in the environmental management of the construction through the elaboration of an executive project of EPC; programs of control of accidents and fires; supervision of activities in the working areas and management of licenses and building permission, The program has a direct relation to the Environmental Education to the development of education activities of the workers in the site.

Current situation:

The program was carried out as proposed in the PBA. Further explanation is provided in the PBA itself, available for consultation.

Conclusion:

The Program was initiated on August 2007 and it was developed during the implementation phase. It was concluded on December 2009.

The impact has been addressed.

23) CONVENTIONAL HYDROLOGIC MONITORING (PERMANENT)

Description:

The program, as presented in the PBA, consists of a five-year schedule, from which two would happen after the reservoir filling. The hydrologic monitoring is required for every hydropower project, because it establishes the course of actions depending on the parameters measured.

Current situation:

Resolution number 396/98 from ANEEL states that HPP Alzir dos Santos Antunes should monitor the hydrographic basin of Rio Passo Fundo River, according to a network composed by three fluviometric stations and three rainfall stations (FIGURE F.29). In addition, data regarding tributary water discharge in controlled by FUNDAGRO (from Portuguese, *Fundação de Apoio ao Desenvolvimento Rural Sustentável*) of Santa Catarina State.

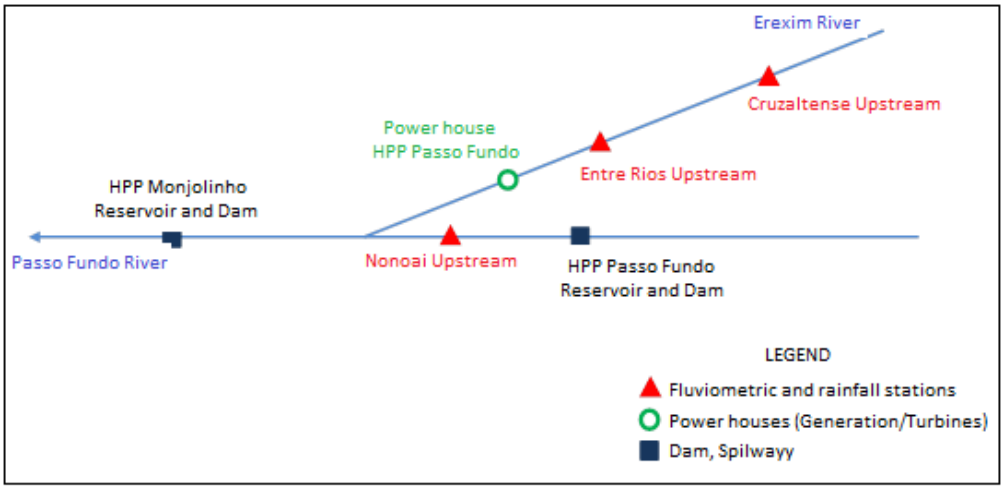


FIGURE F.29: Scheme of the fluviatile and rainfall locations.

Monthly reports are developed and sent to the environmental agency, attached to the quarterly reports.

Conclusion:

The monitoring is permanent, according to the mentioned ANEEL Resolution. Data is daily updated and can be consulted online at the link: ftp://ftp.engevix.com.br/desenvix/desenvix_hidro. The access is enabled by the user evg-dvxhidro and password dvxhidro#9720.

The program is permanent and up to the moment, it has been successfully implemented.

24) SOCIAL COMMUNICATION PROGRAM

Description:

Landscape transformations, such as the implantation of a HPP and all the alterations provoked by it generate impacts, curiosities and doubts among the population of the region, both in direct and indirect entrepreneurship's areas of influence.

In this context, the social communication performs a key role, once it attempts to minimize these feelings and involve the population with the project through the exchange of information, making use of the Program of Social Communication. This program's target people are the ones affected by the construction, the city's authorities, NGOs, syndicates, associations, community leaderships, the press and others that manifest interest.

The interest and manifestation of the population in relation to the themes covered are necessary and fundamental conditions so that this program become successful, both in the form of organization and in the progress of developed actions, which indicate the possibility of alterations and adaptations throughout the execution of the program. Moreover, the interaction and the involvement of the entrepreneur with the population of the region are primary factors to the implantation of the program.

Current situation:

The PBA proposed a three-year program to meet the requests on social communication and institutional relationship. The program started in November 2007 and until the end of 2010 it was executed by a

company called *Fábrica de Comunicação*. After 2011, the program continued, being responsibility of the company *Somar.*

Between 2009 and 2012, innumerous articles and notes were released about matters related to the HPP Alzir dos Santos Antunes implementation and operation, also promoting the ongoing environmental programs. The disclosure was carried out by print press, local radios (*Rádio Clube Nonoai* and *Rádio Amigos*). Some of the articles published are presented as follows (FIGURES F.30 and F.31)

Cidades

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Editor assistente: **Roberto Tavares**

JÜRGEN WIEMER / ESPECIAL / CP

Obra teve investimentos de R$ 252 milhões e capacidade instalada será de 74 megawatts

Hidréletrica de Monjolinho estará concluída em maio

A hidrelétrica Monjolinho, com 74 megawatts de potência instalada e investimento de R$ 252 milhões, já tem 89% das obras concluídas. A usina está sendo construída no rio Passo Fundo, entre os municípios de Nonoai e Faxinalzinho. A previsão é de que até maio esteja pronta a barragem, de 74 metros de altura e já se inicie o enchimento do reservatório.

Conforme o cronograma, no fim de abril deve ser finalizada a montagem da turbina de 37 MW e do gerador da unidade 1. Os testes dinâmicos (com água) começarão em maio, e a geração comercial é prevista para junho. Também já está sendo construída a linha de transmissão de 138 quilowatts, que terá 18,5 quilômetros de extensão e levará a energia gerada à subestação de Passo Fundo, da Eletrosul.

A Monel (Monjolinho Energética), responsável pela Usina Hidrelétrica Monjolinho, solicitou à Fepam a licença que libera a usina para operar no rio Passo Fundo em dezembro de 2008. O pedido foi feito dentro do prazo exigido pela fundação.

Durante a construção da usina, Nonoai deve arrecadar R$ 1,7 milhão em Imposto Sobre Serviços (ISS) e Faxinalzinho, cerca de R$ 790 mil, segundo a empresa responsável pelos trabalhos. Além disso, os quatro municípios atingidos pela hidrelétrica – Nonoai, Faxinalzinho, Benjamin Constant do Sul e Entre Rios do Sul – terão a compensação financeira no período de concessão. A obra conta com o financiamento do BNDES e faz parte do Programa de Aceleração do Crescimento (PAC), do governo federal.

FIGURE F.30: *Article published by local media: "HPP Alzir dos Santos Antunes will be finished by May" (on Feb, 16, 2009).*

Usina preserva palmeiras ameaçadas de extinção

JOSÉ ODY
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O carandá, também conhecido como buriti-palito ou buriti, é uma palmeira rara que está sendo reproduzida pela Monjolinho Energética (Monel) para ser plantada na área de preservação permanente da Usina Hidrelétrica (UHE) Monjolinho. Há um ano, a equipe de biólogos da usina localizou três árvores de carandá, espécie ameaçada de extinção no Estado. Segundo o biólogo Márcio Zanotto, as plantas foram encontradas em um pequeno afluente do rio Passo Fundo, na região próxima de onde foi construída a Monjolinho, entre os municípios de Nonoai e Faxinalzinho. Os exemplares passaram a ser monitorados à espera do período de frutificação. Apenas um, porém, produziu sementes, que foram coletadas e plantadas no viveiro da UHE. "As mudas produzidas farão parte da área de preservação permanente do reservatório (APP) da Monjolinho. O Jardim Botânico de Porto Alegre receberá dois exemplares e outros dois serão enviados ao Jardim Botânico de Caxias do Sul", explica Zanotto.

Segundo o biólogo, o carandá (de nome científico *Trithrinax Brasiliensis*) é uma palmeira que mede de 3 a 15 metros de altura, encontrada na região Sul do país. A planta habita encostas e margens de cursos de água em matas ou áreas abertas, geralmente em altitude superior a 500 metros. Também conhecida como buriti-palito e buriti, é uma planta ornamental utilizada em paisagismo. As folhas são usadas na confecção de chapéus e cestos.

O objetivo da Monel é preservar a biodiversidade no entorno do reservatório da usina hidrelétrica. Além do carandá, a Monel também plantará em sua área de preservação permanente outras árvores em extinção como butiá, araucária e o sucará. Até o final deste ano, serão plantadas 100 mil mudas de espécies nativas, como o umbuzeiro, casca-de-anta, jerivá, cerejeira, angico, cedro, pitangueira e aroeira-vermelha. Até o final do projeto de recuperação da APP, devem ser plantadas 700 mil mudas.

Exemplares da planta rara serão doados aos jardins botânicos da Capital e de Caxias do Sul

FIGURE F.31: *Article published by local media: "Hydropower plant preserves endangered palm species" (on Sep, 20, 2009).*

After 2011, the program began to produce printed brochures with information about the programs. Between the months of January and November of 2011, the program was focused on publishing information about MONEL's action along with the indigenous communities of Votouro Kaingang, Guarani Votouro, Kandóia, Nonoai e Rio da Várzea. The program was concluded on December 2013.

Newsletters published until the end of the program are available for consultation.

Conclusion:

The program was created to involve the community in the project, by publishing accurate information about the stages, the programs, etc. The program was successfully concluded by the end of 2013.

OTHER ACTIVITIES IMPLEMENTED

In addition to the programs proposed and implemented by the PBA, two other activities were carried out by MONEL, in order to improve the project environmental quality. Both of them are discussed as follows.

ENVIRONMENTAL COMPENSATION

In August 2009 MONEL has accured the amount of R$ 1,200,000.00 to be used under the Environmental Compensation in strict complicante with Resolution 02/06 of CONOMA[38]. Since January 2010, MONEL has been transferring resources (financial, services, goods and consulting), meeting SEMA[39] requests and, the amount has been split between two regional institution, as per document *Termo de Compromisso SEMA,* available for consultation.

- Parque Estudual Turvo (16,7% of the resources);
- Parque Estadual do Papagaio Charão (83,3% of the resources);

WASTE MANAGEMENT

The packaging of solid waste generated at the plant currently follows the same measures and restrictions adopted during the implementation phase of HPP Alzir dos Santos Antunes. ENEX is the subsidiary responsible for the HPP O&M and it is also responsible for the solid waste management.

HPP Alzir dos Santos Antunes adopts Resolution CONAMA 271/01 that has standardized in colors the waste separation for recycling purposes. They are:

- Yellow: metals in general;
- Blue: paper and cardboard;
- Red: plastic;
- Green: Glass.

Both MONEL and ENEX offices adopt the colors method to avoid mixing the solid waste.

The waste generated in HPP Alzir dos Santos Antunes are quantified and destined for recycling or to landfill properly licensed by environmental agencies, such as FEPAM (State Foundation of Environmental Protection) or FATMA (State Foundation of the Environment), if applicable. The MONEL solid waste goes to CETRIC (Central of Solid, Industrial and Commercial Waste Treatment). Transportation is carried out in accordance with the conditions established in Brazilian Standards: NBR 1321 and NBR 1183.

FIGURE F.32 presents some examples of the waste management in HPP Alzir dos Santos Antunes.

Recycling bins.

Collection of recipients that stored oils.

[38] From Portuguese, *Conselho Nacional do Meio Ambiente* – National Council of Environment.
[39] From Portuguese, *Secretaria do Meio Ambiente* – Secretary of Environment.

Oil and water separation device in the power house. *Storage of oil waiting for final destination.*

FIGURE F.32: *Waste management measures applied at HPP Alzir dos Santos Antunes.*

DISCUSSION ABOUT THE NET POSITIVE IMPACTS

ACR requires a discussion, demonstrating that the project impacts are, overall, positive. Although many impacts were predicted for HPP Alzir dos Santos Antunes, as already mentioned in the beginning of this section, many of them were avoided or completely mitigated at the project implementation period. Other have been or are still being addressed by the measures proposed. Some of the programs are permanent, because the activities need to be in surveillance as long as the plant is in operation.

The monitoring reports have sufficiently proved that there are many possible reasons for the impacts and they are not always related to the project activity. The entrepreneurship has brought many improvements to the region and the population.

As follows, Table F.1 presents individually the previewed impacts and the discussions relating why and how they have been addressed up to the moment.

TABLE F.1: Summary of HPP Alzir dos Santos Antunes social environmental impacts and measures applied up to the date.

IMPACT	CLASSIFICATION	DISCUSSION
EMPLOYMENT GENERATION	Positive	A program was created to value the local labor (UTILIZATION OF LOCAL LABOR). During the project implementation, a system was created to register all the interested in working for the project construction. MONEL hired as many as local labor as it could and it closed partnerships with the local city halls to encourage the hiring of all those registered in the system.
NOISE	Negative	This impact was covered by the use of individual protection equipment, which is still required and monitored by the Environmental Program, which covers Health and Safety (H&S) issues. Up to the date, there were no complaints about noise from the community nor the workers of MONEL. The impact continues to be monitored by the H&S policy.
TRAFFIC INTENSIFICATION AND CHANGE IN REACHED INFRASTRUCTURE	Negative	Two programs were created to mitigate this impact (RESTRUCTURING OF THE SITE AND INFRASTRUCTURE and PROGRAM OF ADEQUACY IN TRAFFIC CONDITIONS. They have both been successfully implemented and were concluded. A small portion of the population was impacted and the measures adopted have benefited the cities, especially Nonoai, because of the improvements in the roads and infrastructure. The public transportation continues to meet the population demand.
ATMOSPHERIC EMISSIONS	Negative	This impact was covered by the use individual protection equipment and at the time of the project implementation there was a periodic water spray in the roads and construction site.
WASTEWATER AND SOLID WASTE GENERATION	Negative	MONEL has implemented a recycling program, an oil and water separator and a wastewater treatment system.
WATER AND GROUND CONTAMINATION LIFTING OF THE GROUNDWATER	Negative	This impacted is covered by two programs: GROUNDWATER MONITORING PROGRAM and SUPERFICIAL WATER QUALITY MONITORING PROGRAM. The first was already concluded and the results attest that there is no contamination related to the project reservoir. The groundwater levels are also normal. Regarding the superficial waters, the program is permanent and frequently monitored. So far, the water quality index is “good” and no contamination has been observed. The previewed impact has not yet occurred or has been sufficiently prevented or mitigated.
INCREASE OF EROSIVE PROCESSES	Negative	The impact is covered by the PROGRAM OF CONTROL OF EROSIVE PROCESSES. 11 points were identified, from which 9 are completely stable. The other two are under monitoring and do not present any risks. The results have showed that the program has been successfully implemented.
REMOVAL OF VEGETATION	Negative	This impact was covered by three programs: RECOVERY OF DEGRADED AREAS, REFORESTATION PROGRAM and FLORA RESCUE AND SALVATION PROGRAM. The first one has been concluded and 15 areas were recovered. The second one is permanent and regards the production of seedlings and plantation. So far, over 340,000 seedlings have been produced. The last one is also concluded and there was no significant loss of the flora biodiversity.

IMPACT	CLASSIFICATION	DISCUSSION
SCARING THE WILDLIFE	Negative	The FAUNA RESCUE AND MONITORING PROGRAM was created to mitigate the impact, by performing a continued monitoring of the wildlife (insects, amphibians, reptiles, mammals, birds). The results observed a reduction in the biodiversity of some bird species, what could be also related to migratory events. Hunting is also responsible for reducing the number of species. The monitoring is ongoing for three species of insects, three species of amphibians and one species of reptile.
EUTROPHICATION BY MACROPHYTES DEVELOPMENT	Negative	Three zones are permanently monitored by three different barriers, inside the MACROPHYTES MONITORING PROGRAM. The occurrence of macrophytes is strongly related to climate conditions. In 2010, right after the reservoir filling, severe infestation was registered, but no damage was caused to the human or wildlife populations. In 2011, the three zones had none existence of macrophytes. Since 2012, macrophytes are only noticed, but proliferation is not happening. The reservoir does not present an infestation scenario and the impact is constantly mitigated by the permanent monitoring.
INCREASE OF DECEASE VECTORS	Negative	Decease vector are monitored by the FAUNA RESCUE AND MONITORING PROGRAM. Three specimens of the yellow fever were find, along with two specimens of leishmaniasis. No registers of those deceases in the region were found. The impact is being monitored.
SEISMIC DISTURBANCES	Negative	Seismographs were installed in the region during the implementation phase. The population was noticed about the probabilities during the social communication program. According to the results from the SEISMIC MONITORING PROGRAM, no disturbances were registered.
RELOCATION OF AFFECTED POPULATION	Negative	55 families were relocated because of the project implementation. Two types of relocation were performed: urban and rural. The families did not have any tradition or strong laces to the former residences. New properties were provided, along with training and technical assistance, especially for those who chosen the rural modality. The RELOCATION OF AFFECTED POPULATION PROGRAM went on until 2013 and MONEL understands that these families are completely emancipated under the social and economic point of view, what means that program's goals have been completely fulfilled.
CHANGES IN THE AQUATIC HABITAT	Negative	The changes in the aquatic habitat are monitored by the RESCUE AND MONITORING OF THE ICHTHYIC FAUNA, which determined six monitoring points. Changes have been noticed in the species habits, but, as mentioned in the specific item (14), this impact needs constantly monitoring, rescue and release actions until the situation is controlled. And for this reason MONEL performs a permanent program.
LOSSES OF AGRICULTURE AREAS	Negative	The implementation of the reservoir resulted in the loss of agriculture areas. This loss in very small, about 1.0 km² (100 ha). Although no specific measure were applied, MONEL provided technical assistance both to the relocated population and the indigenous communities regarding agriculture activities. The reforestation program is also permanent. This impact can be considered minor.

IMPACT	CLASSIFICATION	DISCUSSION
CHANGES IN THE MICRO-CLIMATE	Negative	The reservoir filling could cause changes in the microclimate, due to the increase of humidity. This impact could result in unfavorable conditions to the habit of some species, both vegetable and animal. No changes related to the project have been identified until the moment.
CHANGES IN THE LAND MARKET	Positive	The impact is potentiated by the improvement of the access roads and implementation of the environmental management program.
PRESSURE OVER PUBLIC INFRASTRUCTURE	Positive	The project proponent has established partnerships with the local governments in order to improve those conditions.
INTERFERENCE IN POTENTIAL ARCHAEOLOGICAL SITES		A program of archaeological survey was carried out.
INCREASE OF CONSERVATION AREAS AND ENCOURAGING PRESERVATION	Positive	Through the environmental compensation component, MONEL transferred R$ 1,169,237.14 to conservation unities. Preservation is also present in the site permanent preservation area, which was surrounded by fences and it is constantly monitored by surveillances under the permanent CONSERVATION AND USE OF THE WATERS AND THEIR SURROUNDINGS PROGRAM. The REFORESTATION PROGRAM is also a huge contribute to the conservation. By far, over 340,000 seedlings of 77 species have been produced.
INCREASE OF ENERGY SUPPLY	Positive	The main positive impact of the project is the increase of renewable energy supply in the country. Energy not only can provide opportunities for localities without access to electricity, but also reduces the impact of fossil fuel fired plants.
INTERFERENCE WITH MINING CONCESSIONS	Positive	With the filling of the reservoir, mining concessions will be prevented. The area was closed by requesting the National Department of Mining.

F2. STAKEHOLDER COMMENTS

Stakeholders should be consulted when planning any carbon project implementation. At the time of the project, idealization letters were sent to the stakeholders presented in TABLE F.2.

***TABLE F.2**: List of consulted stakeholders.*

Local Stakeholders	Name
Faxinalzinho	
City Hall	Mr. Irineu Bertani
Municipal Assembly	Mr. Irineu da Costa
Municipal Agriculture and Environment Secretary	Mr. Ari Jorge Moreto
Nonoai	
City Hall	Mr. Ademar Dall'Asta
Municipal Assembly	Mr. Carlos Gosch
Environment Department	Mr. José Moreira
Benjamin Constant do Sul	
City Hall	Mr. Jairo Cina
Municipal Assembly	Mr. Leonor Cesar Grasieli
Municipal Agriculture and Environment Secretary	M. Claudenir Luís Finato
Entre Rios do Sul	
City Hall	Mr. Volnei Luís Pedott
Municipal Assembly	Mr. Jerry Adriano Payer
Community Associations	
Association of Faxinalzinho Residents	Mr. Ido Marcon
Nonoai's Social Welfare House Love and Charity	Ms. Volnete Zanetti
Association of NONOAI's Children CEMACAAD	Ms. Nair Menegol
Patran	Mr; Fontana
APAE – Association of Fathers and Friends of Nonoai's Exceptional People	Ms. Carmen Debastiani
Commercial, Industrial, Service, Agriculture and Livestock Faxinalzinho's Association	Mr. Edgar Luiz Valentini
District of Nonoai Attorney of Justice	Mr. Marcelo José da Costa Petry
Commercial, Cultural, Industrial, Service and Agriculture and Livestock Nonoai's Association	Mr. Ademir Oliveira
Cultural Association of Community Radio Dissemination Benjamin Constant do Sul	Mr. Gilberto Lovato
Association of Benjamin Constant do Sul Residents	Mr. Arlindo Meneguetti
Commercial Industrial Entre Rios do Sul Association	Mr. Mauri Antônio Benin
Other Local Stakeholders	
State of RS Attorney for Public Interest	Mr. Mauro Henrique Renner
Federal Attorney for Public Interest	Mr. Antônio Fernando Barros e Silva de Souza
Brazilian Forum of NGOs and Social Movements for Environment and Development	Mr. Rubens Born
State Environment Agency	Mr. Carlos Otaviano Brenner de Moraes
Environmental Protection State Foundation Henrique Luís Roessler (FEPAM)	Ms. Maria Isabel Chiapetti

* The letters were sent at the time of the project validation but are not all available for verification,

According to the CDM rejected project, only the Secretary of Agriculture and Environment of the city of Faxinalzinho replied with comments. At the time, they affirmed to be optimistic about the project.

Even though the former CDM project states that the letters on Table 13 were sent, it was not possible to obtain them in this new process, since the environmental consulting responsible for the CDM project could not make this documentation available. However, it is mandatory in Brazil, in any large-scale projects, to perform an Environmental Impact Assessment, where a public hearing is carried out. In addition, all direct and indirect stakeholders should be communicated of the project development. Both actions took place in the project implementation process and all documentation regarding the Public Hearing and stakeholder's consultation is available for validation.

Several meetings have been hold with stakeholders and all records were presented to validation body.

It is important to highlight that the indigenous community was taken into consideration. Representatives of the Indian National Foundation (from Portuguese, Fundação Nacional do Índio - FUNAI) have been invited to participate in the steering committee meetings to point out actions to be implemented according to a Socio Economic Strengthening Program. The following priorities were established by them:

Priority 1: Digital Inclusion in the villages, including the acquisition of computers and computer training.

Priority 2: A program to encourage sports, through the revitalization of an existing gymnasium (including roof coverage and lateral closing).

Priority 3: Implementation of a job and income generation program, where MONEL contributes by costing agricultural supplements, providing technical assistance in agricultural matters and hiring trained technicians to carry out seedling processes.

Besides all records of the Steering Committee available for consultation, at the time of the project implementation MONEL has also received consent from Nonoai and Faxinalzinho City Halls (directly affected by the project). Both evidences are available for consultation.

Compliance with ACR Standard

To attend an ACR Standard demand, the National Designated Authority of Brazil was notified of the development of a voluntary carbon project within ACR. A letter was sent to the Interministerial Committee on Global Climate Change (a division of the Science and Technology Ministry).

The acknowledgement of receipt arrived at September 12, confirming that the Committee is aware of this project's current development.

G.
OWNERSHIP AND TITLE

G1. PROOF OF TITLE

The location where the project is situated is property of Monjolinho Energética S/A. The area is composed by different properties: all of them with a specific documentation. For this reason, the documents were not attached to this project, but are available for consultation at the time of validation. All offsets will, therefore, be owned by Monjolinho Energética S/A, directly owned by DESENVIX Energias Renováveis S/A, in which account the GHG Project Plan should be registered.

G2. CHAIN OF CUSTODY

At the time of this project registration, no forward option contract was established.

G3. PRIOR APPLICATION

Monjolinho Energética S/A was a former CDM project first submitted for validation through Bureau Veritas Certification Holding S/A at the period from April 11 to May 10 in 2008. This period consisted of the stakeholder comments moment. The project was approved by the Brazilian DNA, having received the letter of approval in December 9, 2008. Later, in January 8, 2009, project proponents requested the project registration.

The Board Opinion expressed in the EB 48th Meeting (July, 17, 2009) attested that: "Monjolinho Energética S/A's CDM Project (2362) submitted for registration by the DOE (BVC) could not be registered because the PDD submitted for validation and the project design have undergone major changes without the DOE issuing Corrective Actions Request, and therefore a recommencement of the validation is required". This comment was related to mainly to the changes occurred in the installed capacity between the first version of the PDD put for validation and the PDD submitted for registration.

Project Participants decided to follow the Board recommendation and they updated the PDD, recommencing the validation process. By doing that, it was also necessary to review the CDM methodologies and guidelines.

The second PDD of Monjolinho Energética S/A CDM Project (3261) was finished on May, 10, 2010 and on July 30, 2010, the Board reject the project requesting the following reviews:

"The DOE needs to further explain how it has validated the suitability of the input values to the investment analysis in line with the VVM version 01 paragraph 109, in particular: (a) the investment cost, as it is not clear whether it was applicable at the time of the investment decision, in line with the EB51 Annex 58 paragraph 6; (b) the exclusion of the salvage value, as the analysis is conducted for 34,5 years including 3 years of investment period, while the operational lifetime of the project activity is 35 years; and (c) the assured electricity, as it still corresponds to the initial capacity of 67MW and not to the increased capacity of 74 MW".

The DOE responded to those requests[40] on August 9, 2010 but the project was not registered.

The project did not continue to achieve registration in CDM and it is only listed at their system as a rejected project.

[40] http://cdm.unfccc.int/filestorage/9/D/5/9D5BY38JR274ZQTLSKEM6CAWPXUG1N/3261%20DOE%27s%20response%20to%20request%20for%20review.pdf?t=V0h8bXQybnJrfDChUdiYNOx36x7Ml-9lEyUU

H.
PROJECT TIMELINE

H1. START DATE

Project start date relates to the date when the operations officially started. There are two turbines in this hydropower plant. The first one started operations on September 1, 2009 and the second on September 3, 2009. Therefore, the latter was established as the project start date.

Project start date is September 3, 2009.

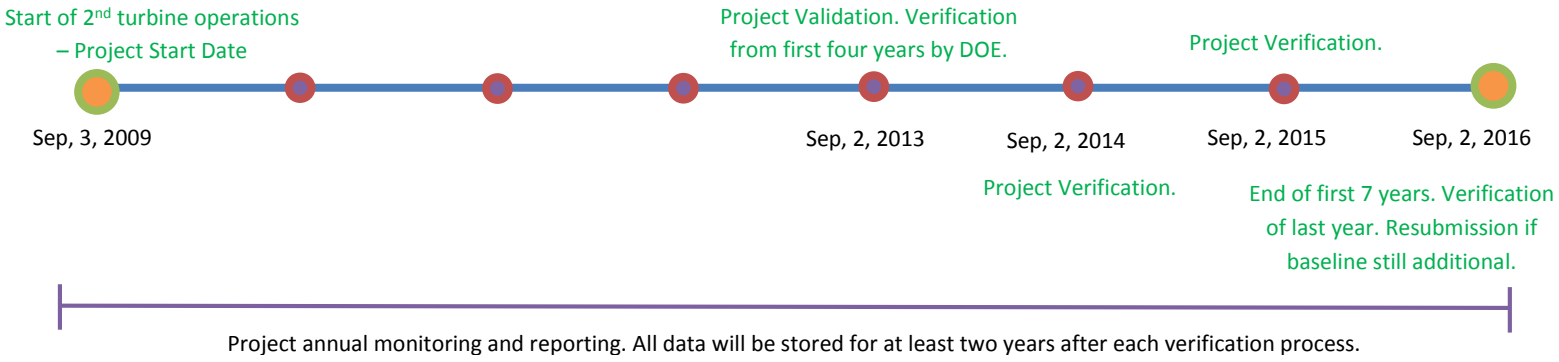
According to ACR Standard, v. 3.0, "*non-AFOLU projects with a Start Date of 01 January, 2000, or later are eligible for registration. Projects whose Start Date is more than two years prior to the date of listing must provide documentation that GHG mitigation was an objective as of the Start Date".*

As mentioned above, in Section G.3, the project was previously submitted to CDM, in 2008, one year before the actual start date. Thus, it is clear that GHG mitigation was an objective previously to the start date.

H2. PROJECT TIMELINE

The project start date is September 3, 2009, but the project is being submitted for ACR register on September 2013. Monitoring reports for verification purposes should be carried out every year. At this first moment, validation and verification of the past year will be done simultaneously, i.e., from September 3, 2009 to September 2, 2013 (four complete years). After that, verification will be carried out annually, until the end of the first crediting period of seven years (to be ended on September 2, 2016).

The project timeline is presented as follows:



ANNEX 1

Proof that the Designated National Authority received the notification of project submittal within ACR.