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14

Verification Report

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

DEVELOPED BY: DNV GL USA AND CANADA SUSTAINABILITY, BUSINESS ASSURANCE

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<p>Summary:</p> <p>Det Norske Veritas (U.S.A.), Inc (DNV•GL) has performed the verification of the GHG emission reduction tonnes achieved by the “Monjolinho Energética S/A Hydropower Plant Project (Alzir dos Santos Antunes)” for the period of 03 September, 2009 to 31 August, 2014. In DNV•GL’s opinion, the GHG emission reductions reported for the project are fairly stated and free of material misstatement.</p> <p>The GHG emission reductions were calculated correctly on the basis of the approved CDM baseline and monitoring methodology ACM0002, version 15.0 and the supporting documentation.</p> <p>Det Norske Veritas (U.S.A.), Inc. is able to certify to a reasonable level of assurance that the emission reductions from the “Monjolinho Energética S/A Hydropower Plant Project (Alzir dos Santos Antunes)” during the period of 03 September, 2009 to 31 August, 2014 equate to 673 609 t CO₂e.</p>			
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ABBREVIATIONS

ACR	American Carbon Registry
AFOLU	Agriculture, Forestry & Land Use
ANEEL	National Agency of Electric Energy
ANSI	American National Standards Institute
CCEE	Brazilian Chamber of Electrical Energy Commercialization
CDM	Clean Development Mechanism
CO ₂ e	Carbon Dioxide Equivalent
DNA	Designated National Authority
ERTs	Emission Reduction Tons
GHG	Greenhouse Gas
PD	Project Document
SIN	Brazilian National Interconnected System

1. INTRODUCTION

Det Norske Veritas (U.S.A), Inc. (DNV•GL) has been contracted by the Embrasca, Inc (Embrasca) to verify the emission reductions generated by the “Monjolinho Energética S/A Hydropower Plant Project (Alzir dos Santos Antunes)” for the period of 03 September, 2009 to 31 August, 2014. The verification was completed as required by the American Carbon Registry Standard Version 3.0, February, 2014 (ACR Standard Version 3.0). This report contains the findings from the verification and a statement for the verified greenhouse gas (GHG) emission reductions.

1.1 *Verification Objective*

Verification is the process through which a verification body assesses a project developer’s GHG reduction assertions against defined verification criteria and standards of the American Carbon Registry (ACR) GHG program. The purpose of verification is to provide an independent third-party review of project data and information being submitted to the ACR, to ensure that the project is eligible as defined in the relevant project reporting protocols.

The ACR requires accredited third-party verification of all GHG projects, as specified in the ACR Standard Version 3.0.¹ Emission Reduction Tons (ERTs) are issued only after a Verification Opinion attesting to their accuracy has been submitted by the verifier and accepted by the ACR. DNV•GL is an American National Standards Institute (ANSI) accredited verifier (Accreditation Number 0981), and is therefore accredited to conduct third-party verifications of ACR projects.

1.2 *Verification Scope and Criteria*

The objective of this verification was to verify the voluntary ERTs reported for the Monjolinho project for the period from 03 September, 2009 to 31 August, 2014 meet the ACR criteria.

The scope of the verification includes:

- Ensuring that the project is eligible according to the specific eligibility rules in the ACR Standard Version 3.0 and the CDM approved baseline and monitoring methodology ACM0002, version 15.0.^{1,2}
- Ensuring the project has designed, measured and monitored baseline and project emissions as specified in the CDM approved baseline and monitoring methodology ACM0002, version 15.0.²

- Reviewing the operations data, project monitoring plan, and record keeping and quantification methodologies, to ensure that the reported GHG reductions are accurate and calculated in line with the CDM approved baseline and monitoring methodology ACM0002, version 15.0.²

According to ACR, the criteria to be applied during this verification include those contained in the following protocols:

- ACR Standard Version 3.0.¹
- CDM approved baseline and monitoring methodology ACM0002, version 15.0.²
- ACR Verification Guideline for GHG Projects, Version 1.1.³
- ISO 14064-3:2006 – Greenhouse gases, Part 3. Specification with guidance for the validation and verification of greenhouse gas assertions.⁴

1.3 *Level of Assurance and Materiality Assessment*

During the verification, DNV•GL has focused on providing a reasonable level of assurance that;

- The project conforms to the ACR Standard Version 3.0 and CDM approved baseline and monitoring methodology ACM0002, version 15.0.^{1,2}
- The emission reduction calculation methodology used is appropriate and correctly applied.
- The ERTs have been monitored, calculated and reported within the 5% materiality criteria.

2. PROJECT INFORMATION

2.1 *Project Background*

The Monjolinho Project is an hydropower plant with an installed capacity of 74 MW. Being a renewable electricity project, the project activity will generate greenhouse gas (GHG) emission reductions by avoiding the CO₂ emissions from the electricity generation by fossil fuel power projects.

The verification team confirmed through visual inspection and document review that all physical features of the proposed ACR project activity including data collection systems and storage systems have been implemented in accordance with the project document⁶.

The electricity supplied to the grid and consumed from the grid is measured in two measurement points – one for direct collection and another used by Brazilian Chamber of Electrical Energy Commercialization (CCEE).

The project activity also comprises of a 450 kVA disel generator to be used as back up.

A visual inspection carried out by DNV•GL during the site visit confirmed that the control system at the hydropower plant is automated and assures continuous operation according to the availability of water on the river.

2.2 Project Activities

The project activity basic equipment consists of two Francis turbines of 37.75 MW nominal power and two generators of 41.11 MVA nominal power. The project activity reservoir area is 5.46 km².

The basic project was approved in 22 May 2007; initially the authorized installed capacity was 67 MW, but later, in 04 June 2008 ANEEL (National Agency of Electric Energy) approved an increase to 74 MW. The project started on 01 September 2009, with the start of activity of the first turbine, but the established start date is 03 September 2009, when both turbines were operating⁸.

2.3 Project Ownership and Involved Parties

Desenvix Energia Renováveis S/A is the primary project proponent and is the sole investor and developer of the project, since it holds 100% of Monjolinho Energética S/A shares. The Embrasca Inc. is providing project development advisory and technical support to Monjolinho project.

3. VERIFICATION ACTIVITIES

DNV•GL has undertaken verification activities and compiled the verification team and tasks based on the complexity of Monjolinho's GHG emission reductions and the underlying data supporting them. The verification team and process are summarized below and in Table 1.

Verification Team	
Felipe Lacerda Antunes	Lead Verifier
Gabriel Baines	Verifier
Andrea Leiroz (Until September 1, 2014)	Senior Internal Reviewer
Wediong Yang (From September 1, 2014)	Senior Internal Reviewer

Table 1: Verification Activities

Task	Activities	Completion Date
1	Verification kick-off meeting	December, 2013.
2	Conflict of Interest form approved by ACR	16 December, 2013

3	Desk review	13 – 29 January, 2014.
4	Site visit	30 January, 2014.
5	Drafting of verification report and review	01 February, 2014 – 17 October, 2014.
6	Quality assurance and corporate review	3 rd November 2014
7	Submission of verification report and opinion to Project Developer	4 th November 2014
8	Verification report and opinion submitted to ACR	12 th November 2014

3.1 Desk Review

The documents provided by the project developer, including the project document (PD), emission reductions spreadsheet, monitoring and reporting, and legal documents were assessed.^{5,6,7,8,9,10,11,12} Initial risk areas related to the emission reduction estimates were identified through the document review. The site visit agenda was prepared according to items noted during the desk review.

3.2 Site Visit

On 30 January, 2014 Gabriel Baines from DNV•GL performed a site visit at the project site in Nonoai, RS and the surrounding area. During the site visit, DNV•GL verified the project facility operation, including the monitoring practices related to the emission reduction estimates, by observation, record review and interviews with staff members. On-site, DNV•GL confirmed that the actual implementation of the project corresponded to the description contained in the project document.⁶

During the site visit, DNV•GL was also able to confirm the emission sources related to the project activity and the risk areas identified during the desk review. DNV•GL also identified and requested additional documents to demonstrate compliance with ACR requirements related to the project start date and emission reduction estimates.

After the site visit, during the report review, Embrasca asked for an extension of the verifying period – the original was from 03 September 2009 to 01 September 2013. In order to verify the additional period 02 September 2013 to 31 August 2014, a new site visit was not required, since all data could be checked against third party information available in Internet – the grid emission factor¹² and the project electricity generation¹¹.

3.3 Results of Sampling Plan

On-site, DNV•GL, in cooperation with Monjolinho and Embrasca representatives, conducted two primary activities related to evaluation of the sampling plan.

1. DNV•GL reviewed the Monjolinho management systems to gain an understanding of how key project parameters are measured and confirm the

measuring mechanisms were consistent from data capture to the emission reduction estimates.

2. DNV•GL visually inspected the site and recorded the following information:
 - Installed equipment.
 - Monitoring devices.
 - Reservoir.
 - Control room.

DNV•GL can confirm that the Monjolinho Project has properly recorded electricity generation values, which were 100% cross-checked against CCEE monthly reports. Furthermore, DNV•GL can confirm that the project activities described in the Project Plan and Monitoring Report are accurate and reflected by the documentation and equipment viewed on-site.^{6,7}

4. VERIFICATION FINDINGS

4.1 Summary

DNV•GL was able to verify that the GHG emission reductions reported for the Monjolinho project are fairly stated. Clarification and corrective action requests were identified during the verification and submitted to the project developer for explanation. Responses and documentation were provided by the project developer to the satisfaction of DNV•GL.

4.2 Project Eligibility Criteria

The ACR Standard Version 3.0 establishes that a project must satisfy some eligibility criteria to meet the definition of a GHG reduction project. DNV•GL verified that the Monjolinho Project is in conformance with these eligibility criteria for the reporting period of 03 September, 2009 to 31 August, 2014. DNV•GL's methods for confirming Monjolinho project's eligibility with the criteria are discussed below.

4.2.1 Project Start Date

DNV•GL verified that Monjolinho began generating electricity 03 September 2009, when both turbines were operating⁸. Therefore, DNV•GL can verify that the project is in conformance with the ACR start date requirements for non-Agriculture, Forestry & Land Use (AFOLU) projects.

4.2.2 Direct Emissions

ACR Standard version 3.0 requires that Monjolinho own, have control or document control over the GHG sources from which the emissions reductions or removals originate. DNV•GL can confirm that Monjolinho Energética S/A owns the Monjolinho project⁸.

4.2.3 Additionality

To qualify as additional, ACR Standard Version 3.0 requires every project to pass either an approved performance standard as defined in the applicable methodology and a regulatory additionality test, or a three-pronged test of additionality in which the project demonstrates that the activity exceeds currently effective regulations, exceeds common practice in the relevant industry sector and geographic region, and faces at least one of three implementation barriers – financial, technological, or institutional.

To confirm that the Monjolinho project meets these requirements, DNV•GL completed the following additionality review process:

1. Considering DNV•GL's local technical expertise, DNV•GL acknowledges that the implementation of a renewable energy electricity project is not mandated by any Brazilian regulation.
2. Confirmed through a review of other projects implemented in the South of Brazil that the project activity does not correspond to a common practice.⁹
3. Confirmed through a review of Monjolinho's Financial Analysis and related files that the project activity faces investment barriers, since the project IRR of 8.62% is lower than the benchmark of 10.82%.¹⁰

DNV•GL's additionality review can confirm that the Monjolinho project meets the additionality standards of ACR Standard Version 3.0¹. DNV•GL's assessment is described in more details in the Monjolinho validation report 2014-0711, that is being submitted in conjunction with this verification report.

4.2.4 Monitoring

The Monitoring Report is in accordance with the requirements of the CDM approved baseline and monitoring methodology ACM0002, version 15.0 and allows for the accurate measurements of actual emission reductions.^{2,7}

Monitoring Data

All the necessary data needed to estimate ERTs are included in the Monitoring Report, PD and Emission Reduction Files, as shown in Table 2.^{6,7}

Table 2: Monitoring Data

Parameter	Measuring Method	Frequency
Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.	Electricity meter.	Continuous.

Parameter	Measuring Method	Frequency
Combined margin CO ₂ emission factor for grid connected power plant in year y.	Brazilian Desinged National Authority official database.	Yearly.
Installed capacity of the hydro power plant after the implementation of the project activity.	ANEEL official data.	Yearly.
Area of the single or multiple reservoirs measured in the surface of water, after the implementation of the project activity, when the reservoir is full.	ANEEL official data.	Yearly.

QA/QC Procedures

All of the necessary QA/QC procedures to ensure the correct measurement, calculation and reporting of emissions reductions are properly defined. These include:

1. Organization and responsibility.
2. Data management and record keeping.
3. Operations and maintenance.
4. Environmental compliance and violation.

4.2.5 Implementation of Monitoring Plan

After reviewing the relevant records, interviewing staff members and observing practices on-site, DNV•GL verified that the Monitoring Report was effectively implemented during the verification period.

4.2.6 The GHG Assessment Boundary

The GHG assessment boundary for the project includes the Monjolinho power plant and all power plants physically connected to the SIN electricity system, as shown in Table 3.

Table 3: GHG Sources Associated with the Project

GHG Source	Comments
CO ₂ emissions from the operation of SIN connected	Calculated as baseline

power plants	emissions
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4.2.7 GHG Emission Reduction Calculations

Equations

The equations to quantify baseline emissions are properly applied for the emissions reduction calculations of the project. Tables 4 and 5 list the baseline and project emissions calculation parameters and the source of the data. For a complete list of annual data for this monitoring period, see Table 7 in the Appendix.

Table 4: Baseline Emission Equation

Parameter	Explanation	Justification
EG_{facility}	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.	Measured value. ¹¹
$EG_{\text{Grid,CM,y}}$	Combined margin CO ₂ emission factor for grid connected power plant in year y.	Official value. ¹²

Table 5: Project Emissions Equation

Parameter	Explanation	Justification
Cap_{PJ}	Installed capacity of the hydro power plant after the implementation of the project activity.	ANEEL official value. ⁹
A_{PJ}	Area of the single or multiple reservoirs measured in the surface of water, after the implementation of the project activity, when the reservoir is full.	ANEEL official value. ⁹

Data Collection, Aggregation, and Calculation

The data collection, aggregation and emission reduction calculations have been planned properly and implemented effectively, as detailed below.

- **Operations monitoring:**
 - ✓ There are two data collection channels in each measurement points. The company uses a channel for direct collection and the other one is used by

Brazilian Chamber of Electrical Energy Commercialization (CCEE) for data sent validation. CCEE compares data available and if an inconsistency occurs, it will be generated a non-conformity report that will be verified with CCEE the cause for the disagreement between the information. Electricity meters are calibrated each 2 years. DNV•GL interviewed personnel on-site and can confirm these are reflective of those outlined in the Monitoring Report.

- **Baseline and project emissions:**

- ✓ Baseline emissions are calculated based on CCEE official electricity generation reports and the official Brazilian grid emission factor.^{11,12}
- ✓ Since the project power density is higher than 10 W/m², according to ACM0002 version 15.0², project emissions from reservoir are not considered.
- ✓ Although not required by ACM0002, project emissions from fossil fuel use (diesel generator) were calculated⁵, and since they correspond to less than 3% of baseline emissions this emission source is neglected⁵.

- **Emission reductions:**

- ✓ The emissions reductions were calculated in accordance with the CDM approved baseline and monitoring methodology ACM0002, version 15.0.¹
- ✓ The calculation was checked by a sampling of data points, and no errors were found.
- ✓ The total baseline, project and ERTs are shown in Table 6.

Table 6: Emission Reduction Calculated

Period	Baseline Emissions (t CO ₂ e)	Project Emissions (t CO ₂ e)	Emission Reductions (t CO ₂ e)
2009 (Sep-Dec)	24 245	0	24 245
2010	132 737	0	132 737
2011	91 970	0	91 970
2012	102 825	0	102 825
2013	180 189	0	180 189
2014 (Jan – Aug)	141 643	0	141 643


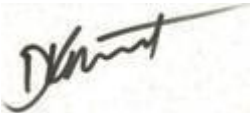
5. VERIFICATION OPINION

Det Norske Veritas (U.S.A), Inc (DNV•GL) has performed the verification of the GHG emission reduction tonnes achieved by the “Monjolinho Energética S/A Hydropower Plant Project (Alzir dos Santos Antunes)” for the period of 03 September, 2009 to 31 August, 2014. In DNV•GL’s opinion, the GHG emission reductions reported for the project are fairly stated and free of material misstatement.

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Det Norske Veritas (U.S.A.), Inc. is able to certify to a reasonable level of assurance that the emission reductions from the “Monjolinho Energética S/A Hydropower Plant Project (Alzir dos Santos Antunes)” during the period of 03 September, 2009 to 31 August, 2014 equate to 673 609 t CO₂e. The emission reductions by individual vintages are presented in the below table.

Period	Emission Reductions (t CO ₂ e)
2009 (Sep-Dec)	24 245
2010	132 737
2011	91 970
2012	102 825
2013	180 189
2014 (Jan – Aug)	141 643

 Lead Verifier Signature	17 October 2014 Date
 Approver Signature	3 rd November 2014 Date

APPENDIX –BASELINE EMISSIONS DATA

Table 7: Monjolinho Baseline Emissions Values

Parameter	Year						Units
	2009 (Sep-Dec)	2010	2011	2012	2013	2014 (Jan-Aug)	
EG _{PJ,y}	186 327	428 292	460 650	285 697	416 901	332 894	MWh
EF _{CM,y}	0.1301	0.3099	0.1997	0.3599	0.4322	0.4255	t CO ₂ e/MWh

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- ⁸ ANEEL, Dispatch 3319, 02 September, 2009, authorizing the beginning of electricity generation on 03 September 2009.
- ⁹ ANEEL: Database of Energy Generation.
- ¹⁰ Embrasca Inc., Investment Analysis File, Submitted to DNV October, 2014.
- ¹¹ CCEE: Monjolinho official generation reports from September 2009 to August 2014.
- ¹² Brazilian DNA: Brazilian SIN CO₂ emission factor from 2009 to 2014.