



VERIFICATION REPORT

VERIFICATION OF VOLUNTARY CARBON EMISSIONS FROM THE JI PROJECT OF ARKHANGELSK PULP AND PAPER MILL IN ARKHANGELSK, RUSSIA

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VERIFICATION REPORT

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Summary:

DNV Certification AS has performed a verification of voluntary emission reductions reported by the 'JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia', for the period 1 January 2001- 31 December 2006. The verification was carried out based on the Voluntary Carbon Standard, version 1.

The GHG emission reductions were calculated on the basis of the baseline and monitoring methodology provided in the PDD previously determined for the project. The verified GHG emission reductions were determined to be 626 427 tCO₂e for the period 2001-2006. The main contribution to the emission reduction originates from the fuel switch from residual fuel oil to bark wood waste.

The verification of reported emission reductions is based on the information made available to us and the engagement conditions detailed in this report. DNV Certification AS can not guarantee the accuracy or correctness of this information. Hence, DNV Certification AS cannot be held liable by any party for decisions made or not made based on this report.

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<i>Table of Content</i>	<i>Page</i>
1 INTRODUCTION	1
1.1 Objective	1
1.2 Scope	1
1.3 GHG Project Description	1
2 METHODOLOGY	3
2.1 Review of Documentation	3
2.2 Site Visit	3
3 VERIFICATION FINDINGS	4
3.1 Project Implementation	4
3.2 Project Baseline	4
3.3 Project Additionality	5
3.4 Completeness of Monitoring	5
3.5 Accuracy of emission reduction calculations	5
3.6 Quality of evidence to determine emission reductions	6
3.7 Management System and Quality Assurance	6
4 VERIFICATION STATEMENT	7
5 REFERENCES.....	8



Abbreviations

CEF	Carbon Emission Factor
CEA	Electricity Authority of Hungary
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNV	Det Norske Veritas
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
PDD	Project Design Document
PPA	Power Purchase Agreement
UNFCCC	United Nations Framework Convention for Climate Change
VER	Verified Emission Reductions
VCU	Voluntary Carbon Units
VCS	Voluntary Carbon Standard



1 INTRODUCTION

Camco International and APPM have commissioned DNV Certification AS to carry out the verification of emission reductions reported for the “JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia” (the project) for the period 1 January 2001 to 31 December 2006. This report contains the findings from the verification and a statement for the verified emission reductions.

1.1 Objective

Verification is the independent review and ex-post determination by the Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the project activity during the defined verification period, and confirm that the project is monitored and operated in accordance with the validated Project Design Document and the Voluntary Carbon Standard version 1, March 2006 /5/.

1.2 Scope

The verification scope is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan for the project activity,
- To evaluate the GHG emission reduction data and express a conclusion with a high level of assurance about whether the reported GHG emission reduction data is free from material misstatement,
- To verify that the reported GHG emission data is sufficiently supported by evidence.

The verification is meant to ensure that reported emission reductions are complete and accurate.

Reporting of emission reductions for the “JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia” is based on monitoring the generation of steam from biomass residues that displaces steam that was partially generated from residual fuel oil. In addition, the reported avoidance of methane emissions from landfilling biomass has been verified.

1.3 GHG Project Description

The project is the refurbishment with efficiency improvement and fuel switch – mainly from residual fuel oil to biomass residues – of the TPP-3 steam generation station of the Arkhangelsk Pulp and Paper Mill (APPM). APPM is located at Novodvinsk town, Arkhangelsk region of Russia. As part of the annual production of more than 800 000 tonnes of pulp, bark and wood waste (BWW) are formed at the mill which is in the project used for energy generation. In addition BWW is supplied by neighbouring sawmills.

The APPM has its own energy production stations that supply both the plant with electricity and heat and the Novodvinsk town with heat. Among others APPM contains the stations TPP-1 that has a 182 MW coal power plant with 10 bar steam output pressure and medium pressure boilers (10 bar, 440°C) based on BWW/Fuel oil mixtures and TPP-3 that before the project had two high pressure utilization boilers (40 bar, 440°C) that used a mixture of BWW (66%) and residual fuel oil (34%) and was partly supplying a 28.6 MW turbine/generator. Use of residual fuel oil was



necessary in order to achieve stable boiler operation. In addition, TPP-3 has three recovery boilers to burn another by-product, black liquor, along with fuel oil.

A third by-product of the process is waste water sludge that is put in a landfill at APPM, but because of the landfill regulations, about 62.5% BWW (weight ratio BWW/sludge) has to be mixed with the sludge in order to get the correct consistency of waste.

The project consists of refurbishing one utilization boiler and replacing one utilization boiler at TPP-3. Both boilers of the project can burn BWW without use of fuel oil except for start-up. In the last years of the project, sludge can also be partially mixed with BWW as fuel even though the net calorific value (NCV) is very low (about 1 MJ/kg, depending on the moisture) compared to BWW (about 8.5 MJ/kg). For comparison the NCV of residual fuel oil is approximately 40.5 MJ/kg. Included in the project is also equipment for preparation of BWW and BWW/sludge mixtures.

The introduction of boilers at TPP-3 that can burn BWW/sludge mixtures has a number of consequences for the energy production at APPM. The efficiency and steam production capacity increases at the utilization boilers at TPP-3. On the other hand, since more BWW is used at TPP-3, less BWW is available for the medium pressure boilers at TPP-1. Less sludge and therefore also less BWW has to be sent to the landfill and this leads to a positive contribution in BWW available for the medium pressure boilers at TPP-1. The change in steam generation at TPP-1 medium pressure station is compensated for by the production of steam from coal at TPP-1 and the net change in coal consumption for the project so far is positive. These effects are taken into account in the calculations of the emission reduction and the largest contribution is the switch from residual fuel oil to BWW.

DNV performed a determination of the "JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia" on behalf of Camco in 2006/2007. From the determination DNV concluded that the emission reductions from the project are additional to what would otherwise have occurred, as it is clearly not representing a business as usual scenario for heat generation in Russia.

The project was implemented in two stages by refurbishing the first utilization boiler from February to December 2000 for use of BWW only and then from April 2004 to July 2005 the other boiler was installed and the fuel for both boilers changed to a BWW/sludge mixture that was gradually increased from 10 to 25% sludge.

Title of the project activity:	JI project of Arkhangelsk Pulp and Paper Mill, Arkhangelsk, Russia
Location of the project activity:	Novodvinsk, Arkhangelsk, Russia
Monitoring period:	1 January 2001 to 31 December 2006
Project starting date:	December 2000



2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project, including;

- Fuel consumption of oil, BWW, sludge and black liquor at TPP-3 and TPP-1
- Estimated change in coal consumption based on steam generation at TPP-3 and TPP-1 medium pressure stations
- NCV of oil, black liquor and BWW
- Amounts of BWW and sludge delivered to the landfill
- Amount of BWW supplied by external suppliers
- Heat generation and supply of heat at TPP-3 and TPP-1
- Emission factor for coal used at TPP-1
- Humidity of sludge

Verification Team:

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GHG Auditor, Energy Sector Expert, Team Leader
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Duration of verification:

Preparation – (monitoring report review) : 31 July - 2 August, 2007

Site visit : 3-4 August, 2007

Reporting : 7-8 August, 2007

2.1 Review of Documentation

The monitoring reports /1/, the monitoring plan and the determination report were all assessed as a part of the audit preparations. In addition the Project Design Document /2/ and the JI determination report /3/ were assessed.

2.2 Site Visit

From 3-4 August 2007, DNV carried out a site visit at the energy stations of APPM in Novodvinsk, Arkhangelsk, Russia. During this visit, DNV verified the actual implementation of the project as described in the PDD, in particular the implementation of the monitoring plan, and the monitoring and reporting of underlying data used for estimation of emission reductions. The evidence of the reported steam generation was also verified.



3 VERIFICATION FINDINGS

3.1 Project Implementation

The project has been implemented as planned and the plant operations are well managed. The two utilization boilers at TPP-3 are in operation and are delivering steam to APPM operations. The rated capacities are 75 and 66 tonnes steam per hour, respectively. There are separate fuel oil meters for the boilers at TPP-3 and for the medium pressure boilers at TPP-1. Steam generation and supply are measured separately from the boilers of TPP-1 and TPP-3. The measurement values are automatically handled by the Damatik software system for TPP-3 and the Asodu software system for TPP-1.

The amount of BWW used in TPP-3 is measured in the control room and the value is manually noted for each shift. For TPP-1, BWW consumption is not measured directly, but estimated based on oil consumption, steam generation and the efficiency that is quarterly determined by a third party. This is cross-checked with the BWW mass balance.

The sludge is transferred from the production site in trucks. Every truck transfer of sludge to be combusted with BWW or to be landfilled is noted in a journal and the numbers accumulated for every shift and month. The sludge and BWW received at the landfill is registered in a similar way. The trucks are of equal size and their weight capacity is checked on regular basis.

The most important parameters for electricity generation and heat generation units, total fuel consumption of each type and heat generation and supply, have for each year been reported to the authorities in the 6-TP form in aggregated numbers for each of the TPP-1 and TPP-3 unit. BWW consumption from outside APPM is also mentioned in this form. Similarly, the sludge and excess BWW (compared to the necessary fraction according to the regulations) deposited in the landfill have been recorded in the 2-TP wastes form. Hence, there is reliable data for these parameters from the start date of the project. The information was also cross-checked with internal annual energy reports from APPM which contains information from each group of boilers at TPP-1 and TPP-3.

Calorific values of BWW/sludge mixtures and fuel oil are tested regularly by competent personnel in a well-equipped laboratory for TPP-1 with calibrated equipment. The NCV for black liquor is measured at the Arkhangelsk Technical University. The NCV for pure BWW, which is used in the calculations of the emission reductions, is estimated by using the NCV of sludge determined at the Arkhangelsk Technical University corrected for the difference in humidity assuming a linear relationship between NCV of BWW and NCV of sludge. The humidity of the sludge is measured at the biological treatment station, which is cross-checked regularly with the central laboratory of TPP-1.

The emission factor of coal for TPP-1 is calculated from a weighted average of the emission factors of the different sources of coal used at the energy station. The emission factors of coal sources in Russia are well documented by the authorities.

3.2 Project Baseline

The baseline of the project is continuation of the previous practice and with production of the same amount of heat from each of the TPP-1 and TPP-3 stations as in the project scenario. The



project emissions are determined directly, whereas the baseline emissions are estimated based on a number of conservative approximations.

The oil consumption of TPP-3 utilization boilers in the baseline case is calculated based on the ex-ante determined fuel oil fraction of 34% and a BWB fuel consumption of 230 000 tonnes. The NCV of BWB in the baseline is assumed to be equal to the project even though the moisture of BWB is lower in the project. This is conservative.

The oil consumption of the TPP-3 recovery boilers is based on the assumption that the total heat output for TPP-3 is the same in the baseline as in the project. The estimated contribution from the recovery boiler in the baseline is assumed to have the same efficiency as for the recovery boilers in the project. It is assumed that fuel oil to black liquor ratio would have increased in the baseline to match the project steam output increase.

The oil consumption in TPP-1 medium pressure boiler in the baseline case is based on the oil to BWB ratio as in the project and the BWB value is calculated from the BWB used in the project corrected for increased use in TPP-3, change in deposit in landfill and change in BWB from outside APPM. The landfill is assumed to have the same ratio of BWB and sludge in the baseline as in the project.

The baseline for the coal contribution is taken as the net change of coal consumption due to the project. Since the total heat generation from TPP-1 is assumed to be the same in the baseline and the project, any change in heat generation from the medium pressure station has to be compensated for by the coal-fired high-pressure station. This change is calculated from the ratio of the fuel consumption in the baseline and the project and the heat generation in the project. From knowledge about the typical coal-fired turbine characteristics the necessary change in heat generation and fuel consumption of coal is estimated. This change of fuel consumption is multiplied with the emission factor of the coal to get the change of emissions.

The baseline for landfilling sludge is the net decrease in the use of the landfill for sludge in the project compared to the baseline. The combustion of sludge instead of using the landfill started with this project in 2005. The BWB/sludge ratio is assumed to be the same for the baseline as for the project. Both change of deposit of sludge and BWB in the landfill is taken into account in the landfill model in addition to a typical carbon content for biomass. The depth of the new landfill, which was opened in January 2004, is also taken into account.

3.3 Project Additionality

The project activity had a validation performed by DNV in 2006/2007. This validation concluded that the project activity is additional to what would have otherwise occurred. Hence, the additionality was not further assessed.

3.4 Completeness of Monitoring

The monitoring of most important monitoring indicators have been assessed as described in 3.1 and found to be fully satisfactory.

3.5 Accuracy of emission reduction calculations

The main input for the emission reduction calculations is the heat generated and fuel consumption of fuel oil. The accuracy and calibration routines have been found satisfactory.



3.6 Quality of evidence to determine emission reductions

The claimed emission reductions in tCO₂e for each year from 2001 to 2006 and also the emission reductions split up for each of the sub-stations at TPP-1 and TPP-3 are shown in the following table:

	TPP-3 Utilization	TPP-3 Recovery	TPP-1 Medium P	TPP-1 High P	Landfill	Total
2001	63 528	14 171	0	0	0	77 699
2002	69 494	39 709	0	0	0	109 204
2003	72 221	48 417	0	0	0	120 638
2004	74 187	9 515	17 938	-31 390	0	70 250
2005	80 229	9 668	7 526	-14 341	716	83 798
2006	76 434	92 396	12 895	-23 660	6 773	164 838
Total						626 427

3.7 Management System and Quality Assurance

Monitoring and reporting of heat and electricity generation as well as waste management is part of normal operations of APPM. The quality of meter readings is assured through calibration of the measurement equipment.



4 VERIFICATION STATEMENT

Det Norske Veritas Certification AS (DNV) has performed a verification of the emission reductions that have been reported for the “JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia” for the period 1 January 2001 to 31 December 2006.

It is DNV’s responsibility to express an independent verification statement on the reported GHG emission reductions from the project.

DNV conducted the verification on the basis of the monitoring plan in the PDD of the project and the monitoring reports for the years 2001-2006. The verification included i) checking whether the provisions of the monitoring plan in the PDD were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV’s verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the “JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia” for the period 1 January to 31 December are fairly stated in the monitoring reports. Confirmation of no double-counting of the VCUs has been received from Arkhangelsk Pulp and Paper Mill and Camco.

The GHG emission reductions were calculated correctly on the basis of the approved JI project and the monitoring plan and formulae provided in the validated PDD of 6 June 2007.

Det Norske Veritas Certification AS is able to certify that the VCU emission reductions from the “JI project of Arkhangelsk Pulp and Paper Mill in Arkhangelsk, Russia” during the period 1 January 2001 to 31 December 2006 amount to 626 427 tonnes of CO₂ equivalent.

Oslo, 2007-08-22

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5 REFERENCES

Category 1 Documents:

Documents provided by the Project Participants that relate directly to the GHG components of the project.

- /1/ Emission reduction monitoring reports of APPM for 2001, 2002, 2003, 2004, 2005 and 2006 dated 26 March 2007.
- /2/ Project Design Document JI: Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill, Version 1.2 31 May, 2007.
- /3/ Determination report JI: DNV 6 June 2007.

Category 2 Documents:

Background documents related to the design and/or methodologies employed in the design or other reference documents.

- /4/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- /5/ VCS-Voluntary carbon Standard version 1, March 2006

Persons interviewed:

Persons interviewed during the verification, or persons contributed with other information that are not included in the documents listed above.

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