DETERMINATION REPORT

Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) Project in Russia

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REVISION NO. 01

DETERMINATION REPORT

~~2007-02-19~~	Project No.: ~~7506501~~
DET NORSKE VERITAS	Organisational unit: DNV Certification, International Climate Change Services
Client: Arkhangelsk Pulp and Paper Mill	Client ref.: Soboleva Tatiana

DET NORSKE VERITAS
DNV CERTIFICATION AS

Veritasvegen 1
N-1322 Høvik
Norway
Http://www.dnv.com

Project Name: Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM)
Country: Russia
GHG reducing Measure/Technology: Boilers fuel switch from fossil fuels to biomass
ER estimate: annual average reduction is 204 290 tones of CO_{2e}.

Size
☑ Large Scale
☐ Small Scale

Determination Phases:
☑ Desk Review
☑ Follow up interviews
☑ Resolution of outstanding issues

Determination Status
☑ Corrective Actions Requested
☑ Clarifications Requested
☑ Full Approval and submission for registration
☐ Rejected

In summary, it is DNV's opinion that, with the exception of the formal approval of the project activity by the focal point of Russia, the project Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) meets all relevant UNFCCC requirements for the JI and all relevant host country criteria.

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Report title:
Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) in Russia

Work carried out by:
Konstantin Myachin, Michael Lehmann, Ole Flagstad

Work verified by:
Einar Telnes

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DETERMINATION REPORT

Abbreviations

AAU	Assigned Amount Unit
APPM	Arkhangelsk Pulp and Paper Mill
BWW	Bark and Wood Waste
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	CO_2 Emission Factor
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
DNV	Det Norske Veritas
EIA	Environmental Impact Assessment
EIC	Environmental Investment Centre
ERU(s)	Emission Reduction Unit(s)
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
HP	High Pressure
JSC	Joint Stock Company
JI	Joint Implementation
JISC	Joint Implementation Supervisory Committee
MP	Medium Pressure
NCV	Net Calorific Value
NGO	Non-governmental Organisation
PDD	Project Design Document
RB	Recovery Boiler
TPP	Thermal Power Plant
UNFCCC	United Nations Framework Convention for Climate Change
WPS	Wood Preparation Shop
WWS	Waste Water Sludge

DETERMINATION REPORT

TABLE OF CONTENTS

DETERMINATION REPORT

1 EXECUTIVE SUMMARY – DETERMINATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a determination of the Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) project. The determination was performed on the basis of UNFCCC criteria for Joint Implementation projects, in particular the verification procedure under the Article 6 supervisory committee (JI track II) described in the Guidelines for the implementation of Article 6 of the Kyoto Protocol, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The project envisages utilisation of the most humid waste biomass (bark and waste water sludge) with humidity content exceeding 70% at the Arkhangelsk pulp and paper mill and the respective substantial reduction of the fuel oil consumption by implementation of the fluidised bed technology of steam generation for technological and heating purposes through two stages of the technical modernisation started in 2000 and 2004. Simultaneously the project reduces the total amount of waste biomass disposal to the landfill.

To date the project is fully implemented and the renovated boilers are in operation.

The project is proposed as a JI project between Russia and one of the European Union countries. However, the focal point of Russia has not yet provided approval letter to the project.

The project developer applied its own baseline and monitoring methodology for the project based on the JI guidance for baseline and monitoring setting, IPCC methodological approaches and own competence. It is sufficiently demonstrated that the project faces several relevant barriers and that the project is thus deemed to generate emission reductions that are additional to any that would have occurred in its absence.

The monitoring management system, including correct handling of measurement instruments and records, has been defined and fully described in the PDD. All data needed for estimation of actual emission reductions is available at the mill; it is duly collected, testified, stored and processed for the mill's managerial and reporting purposes, including voluntary GHG emissions reporting, following the established procedure and approved methodology.

The projected emission reductions are 1 021 452 tones of CO_2eq during the 5 years crediting period (2008-2012). The underlying assumptions have been verified and it is deemed likely that the forecast amount is achieved.

Parties, stakeholders and NGOs were invited to provide comments on the project. No comments were received.

The project is expected to reduce the total environmental impact of JSC "Arkhangelsk pulp and paper mill" activity. The technical design documentation for the project has been submitted to environmental authorities and received positive endorsement.

In summary, it is DNV's opinion that, with the exception of the formal approval of the project activity by the focal point of Russia, the Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) project meets all relevant UNFCCC requirements for the JI and all relevant host country criteria.

DETERMINATION REPORT

2 INTRODUCTION

Camco has commissioned DNV Certification AS to perform a determination of the Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) project in Russia (hereafter called "the project"). This report summarises the findings of the determination of the project, performed on the basis of UNFCCC criteria for the JI, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 6 of the Kyoto Protocol, the Guidelines for the implementation of Article 6 of the Kyoto Protocol and the subsequent decisions by the JI Supervisory Committee.

2.1 Objective

The purpose of a determination is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Determination is a requirement for all JI projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission reduction units (ERUs).

2.2 Scope

The determination scope is defined as an independent and objective review of the project design document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. DNV has, based on the recommendations in the Validation and Verification Manual /4/ employed a risk-based approach in the determination, focusing on the identification of significant risks for project implementation and the generation of ERUs.

The determination is not meant to provide any consulting towards the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

3 METHODOLOGY

The determination consists of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final determination report and opinion.

The following sections outline each step in more detail.

3.1 Desk Review of the Project Design Documentation

The following table outlines the documentation reviewed during the determination:

/1/ CAMCO International, Project Design Document for "Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM)", version 1.1 of 2006-10-25, version 1.2 of 2007-05-31

/2/ CAMCO International, Annex 2.1 (Excel file) to PDD for "Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM)", version 1.1 of 2006-10-25, version 1.2 of 2007-05-31

/3/ CAMCO International, Annex 4 – Annex 27 to PDD for "Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM)", version 1.1 of 2006-10-25, version 1.2 of 2007-05-31

/4/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Determination and Verification Manual*. http://www.vvmanual.info

/5/ JISC, Guidance on Criteria for Baseline Setting and Monitoring, version 01.

/6/ Approved CDM methodology ACM0006 "Consolidated baseline methodology for grid-connected electricity generation from biomass residues", version 5 of 2007-05-18.

/7/ Environmental Investment Centre and Arkhangelsk Pulp and Paper Mill, Minutes of Intentions with regards to development of the greenhouse gases reduction projects, 2000-02-01.

/8/ Institute of Environmental Problems of the North, Russian Scientific Academy, Protocol of examination of the chemical content of the bark and wood wastes in the sample from the Arkhangelsk Pulp and Paper Mill, 2007-02-16.

/9/ Methane and Nitrous Oxide Emissions from Biomass Waste Stockpiles, Worldbank PCFplus research, August 2002

/10/ Government of the Russian Federation, The Decree № 332 "Of approval and verification of realization of the projects performed in accordance with article 6 of Kyoto protocol of the UNFCCC", 2007-05-28.

Main changes between the version published for the 30 days stakeholder commenting period and the final version:

- The revision of the additionality discussion in the PDD to make it transparent and sufficient, adding of the financial analysis into the Excel file annex to PDD;
- The up-date of the PDD structure in accordance with Guidelines for users of JI PDD form.

3.2 Follow-up Interviews with Project Stakeholders

	Date	Name	Organization	Topic
/11/	2006-12-07	Beloglazov Vladimir	APPM, General director	- Additionality of the project - Planes of pulping and mills' energy policy - Results of the project implementation and outlines
/12/	2006-12-07	Kotlov Pavel	APPM, TPP-3 chief	- Baseline and project scenario confirmation - Fix-ante coefficients - Monitoring plan - Current performance of the project
/13/	2006-12-07	Soboleva Tatiana	APPM, head of the environmental department	- Additionality of the project - Baseline and project scenario confirmation - GHG inventory - ERUs estimates - Monitoring plan - EIA
/14/	2006-12-07	Kuznetsov Serguey	APPM, general technologist of the wood preparation	- BWW monitoring system - Monitoring standards, practices and assumptions - Planes of the pulping and respective BWW productions
/15/	2006-12-07	Smirnova Olga	APPM, environmental department	- Monitoring plan - ERUs estimates
/16/	2006-12-07	Kolina Yulia	APPM, environmental department	- GHG inventory and monitoring plan; - ERUs estimates
/17/	2006-12-07	Yulkin Mikhail	CAMCO International, Project manager	- Additionality of the project - Baseline and project scenario confirmation - Monitoring plan

/18/	2006-12-07	Samorodov Alexander	CAMCO International, head of the PDD development section	- Baseline and project scenario confirmation - Fix-ante coefficients - Monitoring plan - ERU estimates

3.3 Resolution of Outstanding Issues

The objective of this phase of the determination is to resolve any outstanding issues which need be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a determination protocol is customised for the project. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The determination protocol serves the following purposes:

- It organises, details and clarifies the requirements a JI project is expected to meet;
- It ensures a transparent determination process where the AIE will document how a particular requirement has been validated and the result of the determination.

The determination protocol consists of three tables. The different columns in these tables are described in the figure below. The completed determination protocol for the Waste Biomass Utilization at Arkhangelsk Pulp and Paper Mill (APPM) is enclosed in Appendix A to this report.

Findings established during the determination can either be seen as a non-fulfilment of JI criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

i) mistakes have been made with a direct influence on project results;
ii) JI and/or methodology specific requirements have not been met; or
iii) there is a risk that the project would not be accepted as a JI project or that emission reductions will not be issued.

A request for clarification (CL) may be used where additional information is needed to fully clarify an issue.

DETERMINATION REPORT

Determination Protocol Table 1: Mandatory Requirements for JI Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**), a **Corrective Action Request (CAR)** of risk or non-compliance with stated requirements or a request for **Clarification (CL)** where further clarifications are needed.*

Determination Protocol Table 2: Requirement checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 2 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the large-scale PDD template, version 01 - in effect as of: 15 June 2006. Each section is then further sub-divided.	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.*	*This is either acceptable based on evidence provided (**OK**), or a **corrective action request (CAR)** due to non-compliance with the checklist question (See below). A request for clarification (CL) is used when the determination team has identified a need for further clarification.*

Determination Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	***Ref. to checklist question in table 2***	***Summary of project owner response***	***Determination conclusion***
If the conclusions from the draft Determination are either a CAR or a CL, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants during the communications with the determination team should be summarised in this section.*	*This section should summarise the determination team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Determination protocol tables

3.4 Internal Quality Control

The draft determination report including the initial determination findings underwent a technical review before being submitted to the project participants. The final determination report underwent another technical review before being forwarded to the Supervisory Committee. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for JI determination and verification.

3.5 Determination Team

Role/Qualification	Last Name	First Name	Country
GHG auditor/JI validator	Myachin	Konstantin	Russia
Sector expert	Lehmann	Michael	Norway
Technical reviewer	Telnes	Einar	Norway

4 DETERMINATION FINDINGS

The findings of the determination are stated in the following sections. The determination criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the determination protocol in Appendix A.
The final determination findings relate to the project design as documented and described in the revised and resubmitted project design documentation.

4.1 Participation Requirements

The project participants are Joint Stock Company (JSC) "Arkhangelsk Pulp and Paper Mill" and he private company "CAMCO International AG".

The host country is the Russian Federation. No sponsor country has been identified to date. The Russian Federation ratified the Kyoto Protocol on 2004-11-18, submitted the national GHG emissions registry to the UNFCCC and executed other actions to fulfil with the Kyoto protocol requirements. The formal approval of the project by Russian Federation has not yet been obtained.

4.2 Project Design

The project is implemented at the JSC Arkhangelsk Pulp and Paper Mill (APPM) located in Novodvinsk town, Arkhangelsk region of Russia. As a part of the production cycle the bark and wood wastes (BWW) are formed on the mill and also delivered there from neighboring sawmills due to wood supply contract commitments. In addition, the plant has a biological treatment station for industrial and household waste that serves APPM and the town of Novodvinsk.

The APPM also has its own energy production stations: TPP-3 for the cellulose production, TPP-2 for the cardboard production and TPP-1 as a general energy production station for generation of steam, hot water and electricity for industrial needs in the mill and supplementary heat and electricity to the Novodvinsk town. The pulping is performed at the cellulose and cardboard production facilities. All the TPPs of APPM are interconnected with steam pipelines and power transmission lines. The mill has been connected to the external

electric power grid, however, for the last few years it has not consumed grid electricity due to the availability of internal generation. The mill is also a heat supplier to the town of Novodvinsk.

The project envisages the increase of the waste biomass utilisation at the plant to produce steam for technological and heating purposes through two stages of the technical modernisation:

- On the stage 1, started in February of 2000, the old and inefficient BWW utilisation boiler model KM-75-40 installed in TPP-3 has been reconstructed for BWW combustion in the fluidized bed, and wood preparation shop #3 has been reconstructed by the installation of modern equipment for chopping and dewatering of the bark in order to improve its quality for the combustion at fluidized bed.
- On the stage 2, started in 2004, the second BWW utilisation boiler of the same model installed in TPP-3 has been replaced for the new utilizing boiler model E-75-3.9-440 DFT designed for waste combustion in the fluidized bed. The boiler has been adjusted for combustion of the BWW/WWS mixture. For provision of the necessary supply of the fuel, a new unit for receiving and preparation of BWW and WWS delivered from external sources by motor transport has been assembled.

The implemented measures have reduced the fuel oil consumption and the amount of BWW and WWS previously landfilled, thus avoiding both the CO_2 and CH_4 emissions as result of the project.

To date the project is fully implemented and boilers are in operation. All the necessary training needs have been successfully performed.

The project activity started in February 2000 with an expected operational lifetime of 25 years. The crediting period constitutes five years starting from the 2008-01-01.

4.3 Baseline Determination

Based on the JI guidance /5/, IPCC methodological approaches and the competence the PDD developer has resulted in project specific methodology being applied for the project. Additionally, some elements of the approved CDM methodology ACM0006 “Consolidated baseline methodology for grid-connected electricity generation from biomass residues” /6/ have been used. In the absence of any approved baseline methodologies for the considered JI project the use of the own-developed methodology is deemed appropriate.

The chosen baseline for the project activity is continuation of the practice that existed at the plant in 1999, which is represented by further use of the waste biomass utilization facilities operated at the time without any modernization or decommission.

Pulping is one of the main production processes of the APPM, affecting the amounts of processed wood and therefore BWW forming as well as the energy demand. JSC “Arkhangelsk pulp and paper mill” developed the perspective production plan that was discussed on the follow-up interview meeting with top-management of the mill. According to the plan the total pulping amount will increase from 840 000 tonnes in 2008 to 1 000 000 tonnes in 2012 by expanding of the facilities for pulping and cardboard production.

The project boundaries include main sources of the GHG emissions:

- TPP-3;

- TPP-1;
- Landfill of industrial waste.

All these sources are located on the APPM site and managed by the enterprise.

The TPP-3 is a power-technological plant, which is designed for regeneration of cellulose production liquor and utilization of the BWW generated (mostly in WPS-3) and generation of steam and power for cellulose production. TPP-3 has three recovery boilers (RB) and two utilization boilers, the steam from these are mixed in the common collector and supplied to the turbine house. The power plant generates electricity in three backpressure turbines. The wasted steam is diverted to the cellulose production and is used for the plant's auxiliary needs.

In the absence of the project, two boilers of model KM-75-40 with mechanical chain grate, designed for burning BWW with fuel oil flame stabilization would be operating in the utilizing boiler-room of TPP-3. It is assumed that TPP-3 would utilize 230,000 tons of BWW per year. This value is fixed-ante, and is deemed conservative as the largest amount of the BWW burnt since 1990 has been reached in 1999 (229 370 tons). Taking into account the age of the boilers it is deemed unlikely that these could have a higher load. The boiler's average gross efficiency factor is fixed at 46%. To ensure an appropriate combustion process 34% of the fuel oil (from total consumption of the fuel expressed in GJ) would be added to the BWW, this value is also fixed-ante. The BWW is estimated to have a humidity of 53% and net calorific value of 7.914 GJ/t, provided date from 1999.

The electricity generation turbines in TPP-3 in the absence of the project would be partially loaded by the high-pressure steam (40 atm) produced through combustion of the additional amount of fuel oil in the recovery boilers. These boilers consume the same amount of the black liquor as in the project scenario and have the same efficiency. To supply the cellulose production with the steam and electricity required due to the insufficient power supply from TPP-3, a significant amount of power would be delivered from TPP-1. It must be noted that the steam delivery to the turbines and electric power generation (as well as supply of the waste steam) at TPP-3 will remain identical in both the project and the baseline scenarios. The values are fixed as the average values for the last three years. However, as soon as the old utilizing boilers produce significantly less steam that new ones, the useful waste steam supply to cellulose production facilities by-passing the turbines in the baseline scenario will not take place and the total steam generation would be equal to the steam delivery to the TPP-3 turbines. This is deemed appropriate since it is more expensive to produce steam for the cellulose production using fuel oil than by using coal as fuel in TPP-1.

The baseline scenario does not consider the heat and electricity consumption for the TPP-3's auxiliary needs as the project is not expected to raise them which is deemed conservative.

The TPP-1 is a power-generating plant designed for generation of steam, hot water and electricity for both for the industrial needs of the mill and for supply to Novodvinsk town. The TPP-1 has two subdivisions: the high pressure (HP) station and medium pressure (MP) station.

The HP station has steam boilers using coal and fuel oil and four turbines with steam condensers by the river water. It has been confirmed during the follow-up interview that for the past years coal has become the increasingly prevailing fuel. At present, the fuel oil

represents only 5% of the total equivalent fuel consumption. This is justified by the fact that fuel oil is more expensive compared to coal.

The MP boilers function by utilization of BWW utilization using fuel oil for flame stabilization. The MP station has two backpressure turbines with 12 MW capacity. A significant part of steam from medium pressure boilers is supplied to consumers through the pressure-reducing cooler, bypassing the turbines. The annual electricity generation is insignificant and barely covers the auxiliary needs of the MP boiler station. In September 2004 boiler #4 was dismounted as a stage 1 of the project has been implemented. However, it is deemed possible that in the baseline scenario the boiler would have continued to operate, as it has been confirmed that provided the proper maintenance it represented a sufficient technical resource.

In the absence of the project activity the BWW consumption at the MP station and respective steam generation would be higher than in the project scenario. Over the last decade the highest amount of the BWW burnt in the TPP-1 MP boilers was in 2002 – 266 242 tons. Any further increase was deemed unlikely due to technical condition of the boilers. It should be noted that since the NCV of BWW burnt in TPP-1 is less than in TPP-3 (due to the MP boilers of TPP-1 burns more coniferous biomass with lesser calorific value) the APPM would utilize BWW in TPP-3 as a priority, which takes into account for the BWW balance for both scenarios.

The average net calorific value of BWW (6 410 GJ/t), the average gross boiler efficiency (69.03%), the percentage of fuel oil in the fuel (32.15% from total consumption of the fuel expressed in GJ) were taken average to the actual data for 2003-2005, which is the same for the project scenario. The commissioning of WPS-4 has no influence on the project and takes place independently, thus the WPS-4 is considered outside the project boundaries.

The TPP-2 is a power-technological plant, which provide for regeneration of the cardboard production liquor. The plant has the same technology as TPP-3 and the energy missing for cardboard production is delivered from TPP-1. Since the project implementation has no influence on the TPP-2 and TPP-2 does not affect the project, it has not been included within the project boundaries. The project does not consider any other facilities and types of activities at the site.

The new landfill for industrial wastes that was commissioned on 2004-01-01 is included into the project boundaries. This is a typical landfill with no system for landfill gas collection. All unburned amount of BWW and WWS is landfilled there. The old landfill closed in December 2003 and is not considered within the project boundaries.

Following GHG emissions have been included into the project boundaries:

	GHGs involved	*Description*
Baseline emissions	CO_2	*Main source of emissions for* - TPP-3, burning fuel oil - TPP-1, burning fuel oil in the MP boiler room - TPP-1, change in coal combustion in the HP boiler room (compared to the project)

	CH_4	- Landfill of industrial waste, anaerobic decomposition of additional amounts of BWW and WWS in the baseline compared to the project scenario
Project emissions	CO_2	*Main source of emissions for* - TPP-3, burning fuel oil - TPP-1, burning fuel oil in the MP boiler room
Leakage	-	*Not considered*

No other sources of GHG emissions are considered. An appropriate justification is given which say that less use of fuel oil during the project activity will result in reduction of the thermal power demand for preheating of the fuel oil at the APPM oil farm. This will reduce the respective CO_2 emissions which in turn will compensate for the emissions from consumption of electricity in the new unit where BWW and WWS is received and prepared and decrease methane emissions from coal mining which again compensate for fuel consumption related to transport of additional amounts of BWW to the APPM. Following this explanation any GHG emission leakages are also not considered that is deemed appropriate.

4.4 Additionality

Additionality of the project is assessed by use of the step-by-step approach, proposed and elaborated by the PDD developer, based on the Guidance on criteria for baseline setting and monitoring, version 01 /5/. The common practice analysis was applied to the project in whole while barrier and investment analysis was applied to each of the two stages separately.

Common practice analysis

It has been confirmed that project activity does not represent any common practice for the Russian pulp-and-paper industry. Most pulp and paper mills in Russia to date are relatively old designed mills and the boiler houses of the mills were initially equipped with BWW fired boilers. However, these are able to combust BWW only with supplemental fuel oil as a stabilizer (30-40% of total fuel consumption in GJ), which is undesirable taking into account the current fuel oil prices. However, even though BWW was more extensively used, this would not make up for the project costs. The boilers with fluidized bed are not widely spread in Russia. The common practice of BWW and WWS disposal is at landfills, which is permitted by the Russian environmental legislation.

It is confirmed that utilization of the humid BWW/WWS mixture without using fuel oil or any other fossil fuel at APPM is the only example of such technology in Russia.

Stage 1 of the project.

Barrier analysis

1. Technological barrier

The old boiler design that existed in 2000 had limited capacity for combustion of BWW with humidity content up to 70%. The APPM would hence either acquire a new boiler or reconstruct the old through the implementation of the fluidized bed technology, however this technology required specific bark and wood wastes humidity content (no more than 60%) and

a certain BWW particle dimension (no longer that 70 mm). To overcome this barrier, new equipment for bark crushing and pressing was needed. This equipment was supplied by a Finish manufacturer, Saalasti Oy, and together with the reconstruction of the boiler this made possible to increase its utilization.

2. Operational barrier

The project represents the first time APPM has commenced operation of a fluidized bed boiler. Significant efforts from APPM's operational end engineering personnel were needed to optimize the boiler performance and improve the boiler design after its commission in order to reach the projected steam output.

Both the technological and operational barrier mentioned above were considered by APPM prior to project implementation and the conclusion made was that these barriers would represent risks for the project implementation and result in an increase in total project costs, in addition to the investments required for boiler installation and start up. The insufficient steam output would also require use of expensive fuel oil, which would make the project's economy insufficient.

3. Financial barrier

It was confirmed during the follow-up interview that APPM financed the first stage of the project with its own funds, however the final decision was taken by APPM management after presentation made by the mill's local consultant – Environmental Investment Centre (EIC) that justified the possibility of future partial project refunding through Kyoto Protocol mechanisms or participation in the voluntary emission reduction market. The respective Protocol of Intentions resulting from the meeting where the investment decision was taken has been verified during follow-up interview and a copy received.

Investment analysis

An investment analysis was made for the first stage of the project and the 20% rate of return was chosen as an internal benchmark. Considering the time the investment decision was made, this is deemed appropriate due to the economic situation in Russia in 2000, the rates for commercial credits at that time and the lending rate of the Central bank of Russia (decreased from 45% in the beginning of 2000 to 25% at the end of 2000). The total investment costs of the project were estimated to be 5.1 million US dollars. As a result of the project, 20 000 tones of fuel oil were expected to be saved at a price of 70 USD per ton.

The *ex ante* investment analysis is attached in an Excel file to the PDD. Following results are presented:

	Projected NPV, USD	Projected IRR, %
Without emission reduction revenues	*- 77 200*	*19.6%*
With emission reduction revenues	759 900	23.3%

A sensitivity analysis has been made by the PDD developer which justified the proposed assumptions to be robust. It has been demonstrated that the 10% increase of project cost over

the planned investment sum would make the project unviable without emission reduction revenue (NPV: -577 000 USD, IRR: 17.5%), while with emission reductions revenue the project still remains attractive (NPV at 260 000 USD, IRR at 21.0%).

Since the project had been already implemented, an ex post investment analysis was also undertaken based on the actual data provided by the mill. According to this data, the actual investment costs appeared to be as much as what had been initially projected. However, the actual fuel oil savings due to the project appeared to be 35 000 tonnes instead of projected 20 000 tonnes. The fuel oil price has also increased over the period from USD 70 per ton in 2000 to USD 126 per ton in 2006. This has resulted in increased figures for the project's NPV and IRR (see Table below).

	Actual NPV, USD	Actual IRR, %
Without emission reduction revenues	7 736 900	*41.7%*
With emission reduction revenues	9 132 000	50.8%

This means the project at that stage was profitable enough and could have been implemented even without selling of GHG emission reductions in the carbon market.

On the other hand, the Stage II of the project was not that beneficial and was designed with reference to Stage I and could hardly be implemented without considering GHG emission reductions revenues. The discussion on this is further elaborated in the below section, based on both projected and actual data.

Stage II of the project.

Barrier analysis

1. Operational barrier

At the second stage of the project implementation APPM's management decided to replace the secondary utilisation of TPP-3 with a new fluidized bed boiler, which gave an opportunity to co-fire BWW and WWS. However, the technology used for preparation and combustion of the BBW/WWS mixture in the fluidized bed boilers was at the time new in Russia and APPM had no experience in WWS burning. It has been confirmed during interviews with APPM's engineering personnel that they had foreseen and actually faced difficulties in identifying the correct ratio between BWW and WWS to form a homogenous fuel mixture needed for steady operation of the boiler. The high humidity of WWS reduced the boiler's steam output. An other issue was a related to selection type of sand for the fluidized bed, due to the physical and chemical properties of the WWS. Thus, the costs and time of the boiler's start up was significantly higher than if a boiler of the same type using only BWW were to be installed. To ensure stable boiler performance, advanced technology for automatic monitoring and control of the boiler operation had to be installed, which again increased the total equipment and maintenance costs.

2. Commercial barrier

Stage II envisages the 80% growth of BWW supplied from outside, from 120 to 200 thousand tons per year. This creates certain commercial risks on APPM, which can be considered as a barrier. The biggest commercial risk is the quality (humidity content) of BWW delivered from external suppliers. As BWW is not considered as commodity in commercial sense of the word, no guarantee can be claimed from BWW suppliers. Another related risk is under-delivery of BWW from the nearby saw mills. This can make APPM organize collection and delivery of BWW from longer distances, which will affect the BWW costs and make these comparable to the cost of coal.

Another factor impacting the price of BWW and its availability for local combustion as a fuel is the further development of the market, especially with regards tomanufacturing of wood fuel granules (pellets) for export (as an alternative to burning BWW locally). At present the sales price of fuel wood is comparable with coal. According to data provided by Russian-Sweden Biocenter[1], the price of low-grade wood is about €10 per dense m^3, and the delivery costs are about €3 per dense m^3 per 100 km. Summing up and applying the net calorific value of BWW 7 GJ/dense m^3 will result in a BWW final price about €1.86 per GJ. The price of coal with delivery costs is about €45 per metric ton. Applying the net calorific value 23 GJ/ton will give €1.96 per TJ. Thus, the two values are relatively comparable. However, the efficiency of combusting coal for energy generation is much higher as compared with combusting BWW. This means that BWW supplied from 100 km distance is suboptimal as fuel for power generation.

3. Financial barrier

It has been confirmed that APPM had financed the second stage of the project with its own funds and a loan provided by the World Bank. The project was initiated with support of the Environmental Investment Centre. Initially, in 2003, a proposed with Partnership for Climate Actions – an informal association of the world largest companies with voluntary GHG emission targets was also established. The World Bank loan for the project was given to APPM on the special conditions after APPM took on a GHG emissions target and presented the second stage of the project. It has been confirmed that APPM would not have deemed the project viable without the World Bank loan criteria of with its own return on investment. After the Kyoto Protocol came into force APPM decided to propose the project as a JI project.

Investment analysis

The investment analysis presented in the PDD for the second stage of project, and the 20% rate of return chosen as an internal benchmark at that time is deemed appropriate for 2003 (the average industrial lending rate was 25% at that year). The total investment costs of the project were estimated as 15.1 million US dollars. The project was expected to save some 40 000 tonnes of oil fuel at a price of 125 USD per ton; however this could only be achieved an additional amount of coal is used at a price of 20 USD per ton.

An *ex ante* investment analysis is attached in Excel file to the PDD, giving the following results:

[1] V.S. Kholodkov, A.F. Rogozin. Production of chips from waste of timber felling arising at cutting of electric mains, gas pipelines and other lines of communications. Russian-Sweden Teaching and Informational Center of Bioenergy. Lisino, Leningrad region. 2005. http://rusbiocenter.spb.ru/file14.php

DETERMINATION REPORT

	Projected NPV, USD	Projected IRR, %
Without emission reduction revenues and World Bank loan	*- 1 702 500*	*17.3%*
With World Bank loan	-165 900	19.6%
With emission reduction revenues and World Bank loan	1 480 900	23.3%

The presented sensitivity analysis in the PDD justifies the proposed assumptions. It has been demonstrated that a 10% increase of project cost over the planned investment sum would make the project investment unattractive without any emission trading revenue (NPV is -1 193 700 USD, IRR is 17.6%).

The figures provided have been verified and the conclusion was made that the second stage of the project is additional due to valid financial, commercial and operational barriers that existed in 2003.

As for Stage I, the actual data related to the project implementation at that Stage II was obtained and an ex post analysis conducted. According to the data available, the actual fuel oil savings appeared to be considerably smaller than projected. Thus, in 2006 the use of fuel oil decreased by only 34 000 tones due to the Stage II while the use of coal increased by 23 322 tones. For the following years, the fuel oil savings are expected to be even less though the amount of coal additionally used for energy generation would also decrease. Hence,,the project's actual NPV and IRR were estimated to be below the *ex ante* numbers (see the Table below). However, adding the revenue from the emissions reduction achieved at Stage I makes the project viable despite the above discrepancies. For the years 2001 through 2006 the actual emission reductions achieved due to the project Stage I and Stage II were used in order to estimate an ex post NPV and IRR.

	Projected NPV, USD	Projected IRR, %
Without emission reduction revenues	- 2 702 758	12.6%
With emission reduction revenues achieved at Stage II	- 1 368 688	16.2%
With emission reduction revenues achieved at both Stage I and Stage II	540 958	21.5%

Based on the above the conclusion is that the second stage of the project as well as the project as whole is additional from a financial point of view.

4.5 Monitoring

4.5.1 Parameters determined ex-ante

The PDD developer applied his own methodology for the project based on the JI guidance /5/, IPCC methodological approaches and own competence. Additionally, some elements of the approved CDM methodology ACM0006 "Consolidated monitoring methodology for grid-connected electricity generation from biomass residues" /6/ have been used. In the absence of any approved monitoring methodologies for the considered JI project the use of the own-developed methodology is deemed appropriate.

The following parameters will be monitored to calculate the project emissions:

- Mass fuel oil consumption at TPP-3 (continuously, t),
- Mass fuel oil consumption in medium pressure boilers of TPP-1 (continuously, t),
- NCV of fuel oil (average value for each lot delivered to APPM, GJ/t).

The measurements will be made with calibrated flow meters or the laboratory equipment (for fuel oil NCV).

Following parameters will be monitored to calculate the baseline emissions:

- Mass BWW consumption in utilizing boilers of TPP-3 (continuously, t),
- Mass BWW consumption in medium pressure boilers of TPP-1 (continuously, t),
- Mass BWW removal to the landfill (continuously, t),
- Mass BWW delivery from the outside (continuously, t),
- Wet mass WWS removal to the landfill (continuously, t),
- Wet mass WWS consumption in utilizing boilers of TPP-3 (continuously, t),
- WWS humidity (with regular intervals, %),
- Dry mass black liquor consumption in recovery boilers of TPP-3 (continuously, tonnes of absolute dry mass),
- Mass fuel oil consumption in recovery boilers of TPP-3 (continuously, t),
- NCV of BWW combusted in utilizing boilers of TPP-3 (with regular intervals, GJ/t),
- NCV of black liquor combusted in recovery boilers of TPP-3 (with regular intervals, GJ/t),
- Total gross steam generation at TPP-3 (continuously, GJ),
- Total useful supply of heat from TPP-3 (continuously, GJ),
- Useful supply of heat from TPP-3 with backpressure steam (continuously, GJ),
- Gross steam generation in recovery boilers of TPP-3 (continuously, GJ),
- Gross steam generation in medium pressure boilers of TPP-1 (continuously, GJ),
- Emission factor of CO_2 for coal (yearly, based on APPM GHG inventory data).

The BWW mass will be monitored with use of the calibrated precision weight meters. APPM has from 2007-02-01 two wood preparation shops: WPS-3 and WPS-4 (which replaced WPS-

2). It has been clarified during the follow-up interview at APPM that WPS-4 will be equipped with an accurate conveyor weight meter at the exit point while the WPS-2 had no such accurate measures for measurements of the BWW. During the site visit and previously the amount of BWW generated in WPS-2 has been determined by a normative calculation method for the wood debarking and crashing equipment used, considering the wood sort and condition. The WPS-3 also has a conveyor weight meter at the exit point.

The BWW delivered from other locations and transported to the landfill are passed through the accurate automobile balances.

The BWW mass flows will be regularly cross-checked with a balance method based on the steam generation.

The mass of the WWS burned in the TPP-3 and landfilled are monitored by recording of the truck type arriving to the water treatment facility for WWS transportation, monitoring of the volume of WWS loaded into the truck (controlled by TV-camera) and periodic weighting of the truck. As the WWS humidity is stable the WWS mass defined via volume of WWS loaded is deemed sufficiently accurate.

The BWW and WWS landfilled are also accounted due the environmental regulations.

The BWW humidity is measured regularly in accordance with a certified method with sampling from the heap of the bark and wood wastes.

The steam generation and heat supply is measured with by calibrated devices and data are continuously displayed and recorded in the APPM's automated information system "Dolmatic".

No leakage is considered under the project activity. This is deemed appropriate and in line with the monitoring methodology applied and the justifications provided in the baseline discussion of the PDD.

It has been confirmed that on-site that operation and maintenance manuals for the TPP-3 and WPS-3 are implemented and maintained. All monitoring and records handling and associated responsibilities are clearly defined. The procedures are established as a part of the integrated quality, environmental and safety management system. Additionally APPM has a separate GHG inventory system. The environmental department with support of the Environmental Investment Center (presently a part of CAMCO International) conducts the annual GHG emissions accounting and will prepare monitoring reports.

4.6 Estimate of GHG Emissions

The calculations of the baseline and project emissions are based on a comprehensive calculation model elaborated by the project proponent and attached as Excel file to the PDD. /2/ The main part of the data for the model is taken from annual GHG inventory of APPM, which is based on the material flow monitoring performed by APPM for its production logistics.

The formulas applied have been assessed and found to sustain a complete and accurate reporting of baseline data, project performance and project emissions data.

The project emissions are CO_2 emissions from burning of the fuel oil at TPP-3 and MP boilers of TPP-1. The emissions are estimated as a multiplication of the amount of fuel oil used (in GJ, the measured NCV for each lot of fuel oil delivered to the mill and the CO_2 emission factor (CEF), which is fixed-ante as 77.13 kg CO_2/GJ (considering the oxidation factor). The CEF was defined by use of reference data for the average carbon content in the different fuel

oil types used at the mill for the past years. This data is derived from the regular GHG inventory at APPM, and has been witnessed and confirmed during the site visit.

The baseline CO_2 emissions from combustion of fuel oil at the TPP-3 and MP boilers of TPP-1 are defined as the same fuel oil CEF, but the amount of the fuel oil used in the baseline are modelled and estimated based on the old TPP-3 boiler performance data and BWW baseline balance.

The baseline CO_2 emissions from additional coal combustion at the HP boilers of TPP-1 have been defined as a multiplication of the estimated amount of the coal burnt by a ex-ante fixed CEF for coal of 91.62 kg CO_2/GJ (again considering the oxidation factor). The CEF was determined by the use of reference data for the average carbon content in various coal types used at the mill in 2003-2005. This data are derived from the GHG inventory at the APPM. The modelled amount of the additional coal combusted is estimated based on the additional annual steam supply for the cellulose production facilities from TPP-1 and taking into account losses in the steam pipelines (3%). The additional steam supply is added from the HP and MP boilers. The steam supply from the MP boilers was defined by the amount of BWW burnt at the boiler, which is derived from the baseline BWW balance model and NCV of BWW burnt in TPP-1.

The steam supplied to the cellulose production facilities has pressure of 10 atm and it is taken from the steam pipeline after its working in the electricity turbine. Since the steam coming to the electricity turbine has a high pressure of 40 atm the delivery of the high pressure steam to the turbines is defined on an operational diagram of the turbines type at HP station and equals 66.5% of the 10 atm pressure steam. To estimate the additional generation of the high pressure steam by the HP boilers the heat losses in the HP workshop and consumption for auxiliary needs are considered (5% of the changed steam generation). Finally, the estimation of the additional coal consumption and the average efficiency factor of the HP boilers (90%) is defined and fixed-ante. The values presented in the PDD have been verified during the follow-up interview and are found to be conservative.

The baseline CH_4 emissions from the anaerobic decomposition of BWW and WWS at the landfill (the new landfill commissioned on 2004-01-01) are estimated in accordance with the model of "Calculation of CO_2-equivalent emission reduction from BWW prevented from stockpiling or taken from stockpiles" model developed by BTG biomass technology group B.V. on the basis of "Methane and Nitrous Oxide Emissions from Biomass Waste Stockpiles, World Bank PCFplus research, August 2002 /9/. It has been clarified that model may be used for other types of biomass than BWW if they correspond to a determined chemical content, in particular with respect to lignin content. The chemical analyses have been carried out for BWW and WWS generated at APPM and demonstrated to DNV. The result of analyses shows the applicability of the proposed model to WWS. The assumptions and factors for the model applied in the context of the project are properly described in the PDD.

Uncertainties are taken into account by the APPM and the resulting calculations need no adjustments since the most conservative coefficients and projections were used for the ERUs estimates.

The emission reduction forecast has been verified and is deemed likely that the forecast amount of 1 021 452 tonnes of CO_{2e} is achieved for the 5 years of the crediting period.

4.7 Environmental Impacts

The project is implemented to date. It has been confirmed that before the start of the project implementation APPM received required a positive endorsement from the relevant local environmental authorities. Currently APPM has all necessary environmental permissions for the TPP-3's BWW boilers.

As a result of the project implementation it has been demonstrated that the gross emissions of harmful pollutants into the atmosphere, the amount of solid wastes disposed to the dump, and amount of polluted waste water disposed has decreased.

4.8 Comments by Local Stakeholders

No special consultations were conducted with local stakeholders which is appropriate as per national JI procedures of the Russian Federation /10/.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD, version 1.0 of 2006-10-25 was made publicly available on JI UNFCCC's official website[2] from 2006-11-11 to 2006-12-10 and Parties, stakeholders and NGOs were through the JI website invited to provide comments during a 30 days period.

No comments were received.

[2] http://ji.unfccc.int/JI_Projects/Verification/PDD

APPENDIX A

JI DETERMINATION PROTOCOL

DETERMINATION REPORT

Table 1 Mandatory Requirements for Joint Implementation (JI) Project Activities

Requirement	Reference	Conclusion
The project shall have the approval of the Parties involved	Kyoto Protocol Article 6.1 (a)	**CAR 1**
Emission reductions, or an enhancement of removal by sinks, shall be additional to any that would otherwise occur	Kyoto Protocol Article 6.1 (b)	OK
The sponsor Party shall not aquire emission reduction units if it is not in compliance with its obligations under Articles 5 & 7	Kyoto Protocol Article 6.1 (c)	OK
The acquisition of emission reduction units shall be supplemental to domestic actions for the purpose of meeting commitments under Article 3	Kyoto Protocol Article 6.1 (d)	OK
Parties participating in JI shall designate national focal points for approving JI projects and have in place national guidelines and procedures for the approval of JI projects	Marrakech Accords, JI Modalities, §20	~~**CAR 2**~~
The host Party shall be a Party to the Kyoto Protocol	Marrakech Accords, JI Modalities, §21(a)/24	OK
The host Party's assigned amount shall have been calculated and recorded in accordance with the modalities for the accounting of assigned amounts	Marrakech Accords, JI Modalities, §21(b)/24	OK
The host Party shall have in place a national registry in accordance with Article 7, paragraph 4	Marrakech Accords, JI Modalities, §21(d)/24	OK
Project participants shall submit to the independent entity a project design document that contains all information needed for the determination	Marrakech Accords, JI Modalities, §31	OK
The project desing document shall be made publicly available and Parties, stakeholders and UNFCCC accredited observers shall be invited to, within 30 days, provide comments	Marrakech Accords, JI Modalities, §32	OK

DETERMINATION REPORT

Requirement	Reference	Conclusion
Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, in accordance with procedures as determined by the host Party shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out	Marrakech Accords, JI Modalities, §33(d)	OK
The baseline for a JI project shall be the scenario that reasonably represents the GHG emissions or removal by sources that would occur in absence of the proposed project	Marrakech Accords, JI Modalities, Appendix B	OK
A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	Marrakech Accords, JI Modalities, Appendix B	OK
The baseline methodology shall exclude to earn emission reductions for decreases in activity levels outside the project activity or due to force majeure	Marrakech Accords, JI Modalities, Appendix B	OK
The project shall have an appropriate monitoring plan	Marrakech Accords, JI Modalities, §33(c)	OK

DETERMINATION REPORT

Table 2 Requirements Checklist

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity *The project design is assessed.*					
Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	The project spatial boundaries are clearly defined. The project activity is located at the JSC "Arkhagelsk Pulp and Paper Mill" (APPM), Novodvinsk town, Arkhangelsk region, Russia.		OK
Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR	The project boundaries include CO_2 emissions from: ▪ TPP-3 (burning fuel oil) ▪ TPP-1 (burning fuel oil in the MP boiler room) ▪ TPP-1 (change in coal combustion in the HP boiler room, compared to the project), and CH_4 emissions from the landfill of industrial waste (commissioned in 2004), due to anaerobic decomposition of additional amounts of BWW and WWS in the baseline compared to the project scenario		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Participation Requirements *Referring to Part A and Annex 1 of the PDD as well as the JI glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.*					
Which Parties and project participants are participating in the project?	/1/	DR	The legal entity project participant is JSC "Arkhangelsk Pulp and Paper Mill", Russia. Camco International GmbH (Austria) is the project Carbon Asset Developer.		OK
Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR	The Letter of Approval of the host country Russian Federation has not been submitted to DNV. The JI focal point of Russian Federation has not been officially designated yet.	CAR 1 ~~CAR 2~~	
Technology to be employed *Determination of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The AIE should ensure that environmentally safe and sound technology and know-how is used.*					
Does the project design engineering reflect current good practices?	/1/	DR I	Yes. It has been confirmed that project design constitutes good practice at both stages of the project.		OK
Does the project use state of the art technology or would the	/1/	DR	The project uses the significantly better		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
technology result in a significantly better performance than any commonly used technologies in the host country?		I	performance technologies than commonly used in the pulp and paper industry in Russia at both stages of the project. The utilization of the humid BWW/WWS mixture without using fuel oil or any other fossil fuel envisaged by the stage 2 is a single example of such kind in Russia.		
Does the project make provisions for meeting training and maintenance needs?	/1/	DR I	Yes. The project has been implemented several years ago. It has been confirmed that necessary training and maintenance needs are provided as a part of the usual production practice at the mill.		OK
B. Project Baseline *The determination of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
Is the discussion and selection of the baseline methodology transparent?	/1/	DR	Yes, the discussion and selection of the baseline methodology is transparent. All necessary information is provided in the PDD and in the annexes.		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Does the baseline methodology specify data sources and assumptions?	/1/	DR I	The source of the data used for the baseline and project is clarified and verified during the site visit		OK
Does the baseline methodology sufficiently describe the underlying rationale for the algorithm/formulae used to determine baseline emissions (e.g. marginal vs. average, etc.)	/1/ /2/ /9/	DR I	The baseline emissions include the CO_2 emissions of from burning of fuel oil at TPP-3, the CO_2 emissions from burning fuel oil in the MP boiler room at TPP-1, the CO_2 emissions from coal combustion at TPP-1 related to the project activity and CH_4 emissions from anaerobic decomposition of additional amounts of BWW and WWS at the landfill in the baseline compared to the project scenario. The calculations of the baseline and project emissions are based on the comprehensive calculation model elaborated by the PDD developer and attached as Excel file to the PDD. Sufficient justification of the model is made in the PDD. The baseline CO_2 emissions from burning of the fuel oil at TPP-3 and MP boilers of TPP-1 are estimated based on the old TPP-3 utilising boilers performance date and BWW baseline		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
			balance and CO_2 emission factor for oil combustion same for the project scenario (from GHG inventory date of APPM). The baseline CO_2 emissions from additional coal combustion at HP boilers of TPP-1 have been defined as multiplication of the estimated amount of the coal burnt and fixed-ante CEF for coal (from GHG inventory of APPM). The modelled amount of the additional coal combusted is estimated based on the additional annual steam supply for the cellulose production facilities from HP and MP boiler of TPP-1 taking into account losses in the steam pipelines. The steam supply from MP boilers was defined on the amount of BWW burnt at the boiler estimated by the model. The steam supply from HP station has been assumed to be taken after the electricity turbines with pressure 10 atm that in order to define the change of steam output from the boiler of 40 atm pressure required to use operational diagram of the turbines type at HP station. To estimate the additional generation of the high pressure steam by the HP boilers the heat losses in HP workshop and		

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
			consumption for auxiliary needs are considered. Eventually the estimation of the additional coal consumption is made based on the average efficiency factor of the HP boilers. The avoided CH_4 emission from landfill in the BWW and WWS decay process has been estimated in accordance with the "Methane and Nitrous Oxide Emission from Biomass Waste Stockpiles, World Bank, PCFplus research, August 2002. The model was based on the first order decay method with experimental specification of a number of parameters for waste wood landfills. The model's applicability to the WWS decay has not been justified.	~~CL 1~~	
Does the baseline methodology specify types of variables used (e.g. fuels used, fuel consumption rates, etc)?	/1/	DR	Yes. The baseline methodology sufficiently specifies all variables used to calculate the GHG emissions.		OK
Does the baseline methodology specify the spatial level of data (local, regional, national)?	/1/	DR	The PDD mentions that local APPM's date is used in the baseline methodology. The data source is provided in PDD and verified during site visit.		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
What is the baseline scenario?	/1/	DR	The baseline scenario reproduces the situation when APPM would continue to use and maintain the BWW utilizing equipment existed in 1999 without its modernization or decommission. In the absence of the project two boilers model KM-75-40 with mechanical chain grate designed for burning BWW with fuel oil flame stabilization would be operating in the utilizing boiler-room of TPP-3 and utilize 230 thousand tons of BWW per year and that is fixed-ante. It is unlikely that they could be loaded more since the largest amount of the BWW burnt has been reached in 1999 (229 370 tons). The BWW consumption at MP station of TPP-1 and respective steam generation would be higher than in the project scenario. Over the last decade the highest amount of the BWW burnt in the TPP-1 MP boilers was in		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
			2002 – 266 242 tons. The further increase would be unlikely due to technical condition of the boilers. The BWW formation is estimated based on the perspective plan of APPM's production increase and it's the same for the baseline and project scenario. However in the baseline scenario the amount of BWW utilized is lesser. The baseline estimation of the CH_4 emissions from BWW and WWS decomposition on the landfill is made only for the new landfill open on 2004-01-01.		
What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR	The one alternative for the proposed baseline is a project activity. The justification of choice of the baseline scenario has been made in additionality discussion.		OK
Has the baseline scenario been determined according to the methodology?	/1/	DR	Yes. The methodology was developed specially for the project.		OK
Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR I	Yes. It has been confirmed during follow-up interviews that conservative assumptions were used for determination of the baseline scenario.		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR I	The explanation of economic conditions existed in 1999 and 2003 and justification of choice of the baseline scenario has been made during the follow-up interview. These conditions and internal economic factors of APPM had major influence to the baseline scenario and its alternative (projects itself). The baseline scenario complies fully with environmental legislation in Russia. No significant political efforts or aspirations took place with regards to project's scope.		OK
Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	The baseline scenario determination is compatible with the available data. The literature and sources are clearly referenced in PDD.		OK
Have the major risks to the baseline been identified?	/1/	DR I	It has been clarified on the follow-up interview that in 2006 APPM has already solved the technical and operational problems occurred after implementation of each stage respectively. No other major risks have been identified to the baseline. The project is fully operational and supported by the top-management of the		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
			mill.		
Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
What is the methodology selected to demonstrate additionality?	/1/	DR	The PDD developer use the own methodology to explain the additionality of the project.		OK
Is the project additionality assessed according to the methodology?	/1/	DR I	No. The explanation of additionality of project is not well structured, traceable and transparent. The financial, commercial and technological barriers are described in the PDD but not sufficiently justified.	~~**CAR 3**~~	OK
Are all assumptions stated in a transparent and conservative manner?	/1/	DR I	No. See previous comment.	~~CAR 3~~	OK
Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	During the follow-up interview at the mill the clarification and justification of the various barriers opposed the stage 1 and stage 2 of the project have been made. However the PDD, version 1 lacks the additionality evidences.	~~CAR 3~~	OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR	The starting date of the project is February 2000 when the construction works for the stage 1 begun. The operational lifetime of the project is 25 years.		OK
Is the start of the crediting period clearly defined and reasonable?	/1/	DR	The length of the crediting period is 5 years from 2008-01-01 to 2012-12-31.		OK
D. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
Is the monitoring plan documented according to the chosen methodology and in a complete and transparent manner?	/1/	DR I	The PDD applies the practice of monitoring and registration of fuel, energy, waste material flows and assessment of environmental impact used at Arkhanglesk Pulp and Paper Mill.		OK
Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of ERUs, for this project activity, whichever occurs later?	/1/	DR I	Yes, it has been confirmed during the site visit.		OK
Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/	DR I	Yes. The monitoring plan contain necessary measured and logged parameters for calculations of the CO_2 project emissions within crediting period: ▪ Consumption of the fuel oil at TPP-3; ▪ Consumption of fuel oil at MP boilers of TPP-1; ▪ Net calorific value of fuel oil used. This monitoring tooks place for several years after the project implementation.		OK
Are the choices of project GHG indicators reasonable and conservative?	/1/	DR	Yes.		OK
Is the measurement *method* clearly stated for each GHG value to be monitored and deemed appropriate?	/1/	DR I	Yes, the measurements methods are deemed appropriate. The calibrated fuel oil flow meters at boilers are used for measurements. The date is cross-checked with readings of level meters in the fuel oil storage tank. The NCV of fuel oil is measured in the certified APPM's laboratory in accordance with approved standard.		OK
Is the measurement *equipment* described and deemed appropriate?	/1/	DR	Yes. See previous comments.		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	Yes, the measurement accuracy is addressed and deemed appropriate.		OK
Is the measurement *interval* identified and deemed appropriate?	/1/	DR	The fuel oil consumption is monitored continuously. The NCV of fuel oil is measured for each lot received and the average value of the year is applied for annual project emissions calculation.		OK
Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1/	DR	The procedures of registration, monitoring, measurements and reporting are established and maintained at APPM as a part of integrated quality, environmental and safety management system.		OK
Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Yes.		OK
Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	Yes. The main production parameters of APPM, including fuel flows are monitored on-line and logged in the APPM's automated information system "Dolmatic".		OK
Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for*					

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
reliable and complete baseline emission data over time.					
Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR I	The monitoring plant in the PDD applies the practice of monitoring and registration of fuel, energy, waste material flows and appropriate with regards to baseline emissions determination in accordance with monitoring methodology developed.		OK
Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	Yes, the baseline indicators are reasonable and conservative.		OK
Is the measurement *method* clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR I	Yes, the measurements methods are deemed appropriate. The BWW and WWS consumption in the boilers and removal to landfill are weighted with calibrated scales. The date will be cross-checked with BWW and WWS balances estimated by APPM through input of raw materials and waste water. The calibrated fuel oil flow meters at boilers are used for measurements. The date is cross-checked with readings of level meters in the fuel oil storage tank (date are same for the project emissions). The WWS humidity and NCV of biomass		OK

DETERMINATION REPORT

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			and fuel oil is measured in the certified APPM's chemistry laboratory in accordance with approved standard. The steam generation and steam supply are measured with calibrated flow meters. The CO_2 emission factor for coal is determined by account of types of burnt coals in a yearly inventory of GHG emissions at APPM.		
Is the measurement *equipment* described and deemed appropriate?	/1/	DR	Yes. See previous comments.		OK
Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	Yes, the measurement accuracy is addressed and deemed appropriate. The uncertainty level of date in considered to be low.		OK
Is the measurement *interval* for baseline data identified and deemed appropriate?	/1/	DR	The most of the parameters of monitoring plan are measured continuously. The NCV of fuel oil is measured for each lot received and the average value of the year is applied for annual project emissions calculation. The NCV of black liquor combusted in recovery boilers of TPP-3 and WWS		OK

DETERMINATION REPORT

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			humidity are measured on the regular basis in accordance with APPM's monitoring procedures for its accounting and the average value of the year is applied for annual project emissions calculation. Each lot of the coal received is record at APPM and then the average CO_2 emission factor is defined by the end of the year based on respective EF for each type of the coal.		
Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1/	DR I	The procedures of registration, monitoring, measurements and reporting are established and maintained at APPM as a part of integrated quality, environmental and safety management system.		OK
Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR I	Yes.		OK
Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR I	Yes. The main production parameters of APPM, including fuel flows are monitored on-line and logged in the APPM's automated information system "Dolmatic".		OK
Monitoring of Leakage *It is assessed whether the monitoring plan provides for*					

DETERMINATION REPORT

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reliable and complete leakage data over time.					
Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	As has been justified in section B.3 of the PDD leakages can be neglected.		OK
Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
Is the authority and responsibility of overall project management clearly described?	/1/	DR I	Yes, the authority and responsibility of the project management is clearly described.		OK
Are procedures identified for training of monitoring personnel?	/1/	DR I	The necessary training and maintenance needs are provided as a part of the usual production practice at the mill		OK
Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR I	Procedures for emergency preparedness for cases where emergencies can cause unintended emissions are identified during the site visit.		OK
Are procedures identified for review of reported results/data?	/1/	DR I	Yes. The task is performed by APPM's environmental protection department according to the internal formal procedure.		OK
Are procedures identified for corrective actions in order to	/1/	DR	Procedures for corrective actions in order to		OK

DETERMINATION REPORT

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provide for more accurate future monitoring and reporting?			provide the more accurate future monitoring and reporting are identified and confirmed during the site-visit. This task is performed by APPM's environmental protection department according to the internal formal procedure.		
E. Calculation of GHG Emissions by Source *It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.*					
Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
Are the calculations documented according to the chosen methodology and in a complete and transparent manner?	/1/ /2/	DR I	Yes. All applied calculations were presented in the PDD or supporting Excel files and confirmed on-site. The comprehensive model of calculations has been elaborated by the PDD developer based on the approved perspective plan of production at APPM. The main part of date		OK

DETERMINATION REPORT

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			for the model is taken from annual GHG inventory of APPM which is in one's turn built up on the material flows monitoring performed by APPM for its production logistic chain.		
Have conservative assumptions been used when calculating the project emissions?	/1/	DR I	Yes. It has been confirmed during follow-up interviews that conservative assumptions were used for determination of the baseline scenario. These assumptions are properly justified in the PDD and verified during the follow-up interview and site visit.		OK
Are uncertainties in the project emission estimates properly addressed?	/1/	DR I	The uncertainties related to the energy production as estimated by PDD developer does not exceed 3% and with use of conservative coefficients are properly taken into account.		OK
Calculation of GHG Emission Reductions – Baseline emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
Are the calculations documented according to the chosen methodology and in a complete and transparent manner?	/1/	DR	As has been justified in section B.3 of the PDD leakages can be neglected.		OK

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR I	Yes. It has been confirmed during follow-up interviews that conservative assumptions were used for determination of the baseline scenario. These assumptions are properly justified in the PDD and verified during the follow-up interview and site visit.		OK
Are uncertainties in the baseline emission estimates properly addressed?	/1/ /9/	DR I	The uncertainties related to the energy production as estimated by PDD developer does not exceed 3% and with use of conservative coefficients are properly taken into account. It was confirmed that uncertainties of CH_4 emissions from landfill as addressed by using of the conservative parameters for the first decay order of "Methane and Nitrous Oxide Emission from Biomass Waste Stockpiles, World Bank, PCFplus research, August 2002. The BWW/WWS estimation subjected to highest uncertainty for the baseline emission model due to physical features and weighting monitoring. The uncertainty has been addressed by use of conservative assumptions in the BWW/WWS balance models.		OK
Calculation of GHG Emission Reductions – Leakage					

DETERMINATION REPORT

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV *	COMMENTS	Draft Concl.	Final Concl.
It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.					
Are the leakage calculations documented according to the chosen methodology and in a complete and transparent manner?	/1/	DR	As has been justified in section B.3 of the PDD leakages can be neglected.		OK
Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/	DR	Yes. The emission reduction forecast has been verified and is deemed likely that the forecast amount of 1 021 452 tonnes of CO_{2e} is achieved for the crediting period.		OK
F. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the AIE.*					
Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	Yes. The PDD sufficiently describes the main environmental impacts related to the project implementation and how the project complies with the environmental legislation.		OK

DETERMINATION REPORT

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Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/	DR I	During follow-up interviews on site it has been confirmed that technical design documentation for the project, including the EIA has been submitted to the respective expertise and got the positive endorsement from environmental authorities.		OK
Will the project create any adverse environmental effects?	/1/	DR	No. The project implementation results in reduction of sulphur dioxide, nitrous dioxide and carbon oxide emissions into the atmosphere. Average annual emission reduction of atmospheric pollutants (for 5 years of crediting period) is estimated to be 1701 tones/year. The project results in decrease of waste water discharge and significant reduction of the BWW/WWS disposal to the landfill.		OK
Are transboundary environmental impacts considered in the analysis?	/1/	DR	Yes. See previous comments.		OK
Have identified environmental impacts been addressed in the project design?	/1/	DR	Idem.		OK

DETERMINATION REPORT

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Does the project comply with environmental legislation in the host country?	/1/	DR I	The project is implemented to date. It has been confirmed that before the start of the project implementation APPM received all the required positive endorsement of the environmental expertise performed by the local environmental authorities. Currently the APPM has all necessary environmental permissions for the TPP-3's BWW utilisation boilers exploitation		OK
G. Stakeholder Comments *If required by the host country, the AIE should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
Have relevant stakeholders been consulted?	/1/	DR	The PDD version 1 has been published on UNFCCC JI website from 2006-11-11 to 2006-12-10. Parties, stakeholders and observers were invited to provide comments the UNFCCC mail list. No comments were received.		OK
Have appropriate media been used to invite comments by local stakeholders?	/1/ /10/	DR	No, as it is not required by the national JI procedures		OK
If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder	/1/		No. The stakeholder consultation process with respect to JI is not required by the JI		OK

DETERMINATION REPORT

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consultation process been carried out in accordance with such regulations/laws?	/10/		procedures in the host country. The stakeholder consultations with regards to environmental impact were not required by the legislation.		
Is a summary of the stakeholder comments received provided?	/1/	DR	No. See previous comments.		OK
Has due account been taken of any stakeholder comments received?	/1/	DR	See previous comments.		OK

DETERMINATION REPORT

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by determination team	Ref. to checklist question in table 2	Summary of project owner response	Determination team conclusion
CAR 1 The Letter of Approval of the host country Russian Federation has not been submitted to DNV.	Section A.		
CAR 2 The JI focal point of Russian Federation has not been officially designated yet.	Section A.		On 2007-05-28 the Government of the Russian Federation issues a Decree #332 that set up a national JI procedures and as part of which the Ministry of Economic Development and Trade has been officially designated as JI focal point of Russia. The CAR is therefore closed.
CAR 3 The explanation of additionality of project is not well structured, traceable and transparent. The financial, commercial and technological barriers are described in the PDD but not sufficiently justified.	Section B.	The addiitonality section on the PDD has been revised. Several barriers for both stages of project implementation have been described, including financial arguments. Minutes of Intentions with regards to development of the greenhouse gases reduction projects signed in 2000 prior to the project's stage I commission were submitted to DNV.	The given clarifications and revision of the PDD (including financial models) with regards to additionality issues are deemed adequate. The arguments provided by the project developer have been discussed during the follow-up interview and site visit in December 2006. The CAR is therefore closed.

DETERMINATION REPORT

Draft report clarifications and corrective action requests by determination team	Ref. to checklist question in table 2	Summary of project owner response	Determination team conclusion
CL 1 The avoided CH_4 emission from landfill in the BWW and WWS decay process has been estimated in accordance with the "Methane and Nitrous Oxide Emission from Biomass Waste Stockpiles, World Bank, PCFplus research, August 2002. The model was based on the frst order decay method with experimental specification of a number of parameters for waste wood landfills. The model's applicability to the WWS decay has not been justified.	Section B.	Special chemical analyses have been carried out for BWW and WWS formed at APPM (see Annex 2.5 to PDD). Results of analysis of chemical content of WWS (protocol from 16.02.2007) performed by Institute of Ecological problems of North of Russian Academy of Sciences shown applicability of the proposed method to WWS also. The lignin content which is a main limiting factor of the used first order decay model' applicability was found to be absent in the WWS sample that is typical, taking into account the origin of WWS at the mill.	The protocol of WWS's chemical content analysis has been submitted to DNV and discussed with the project developer. The presented argumentation satisfied DNV and final conclusion is made that used model of CH_4 emissions estimation is applicable for WWS formed at the APPM. The CL is therefore closed.