CLEAN DEVELOPMENT MECHANISM
PROJECT DESING DOCUMENT FORM (CDM-SSC-PDD)
Version 03 – in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to Version 3. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	15 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

“Aços Villares Natural gas fuel switch project”
Version 03
04/01/2007

A.2. Description of the small-scale project activity:

Aços Villares S.A., hereafter referred to as Aços Villares or the ‘project developer’, is a steel company and, nowadays, operates three units in Brazil: Sorocaba, Mogi das Cruzes and Pindamonhangaba. The project activity is restricted to Pindamonhangaba unit, the largest site in Brazil. Pindamonhangaba started operation in 1979, and its core business is the production of steel from scrap metal. It has been using fuel oil, LPG and electricity as the main energy sources for all the processes up to the year 2002.

The natural gas pipeline arrived in Pindamonhangaba in the nineteen nineties, but only in 2002, considering the additional carbon credit revenues, Aços Villares started a fuel switch process from fuel oil to natural gas. Given the high prices of natural gas, and the high investment required for conversion, the CERs brought the necessary financial benefits to make the implementation of the project possible (details in section B.3).

The project activity consists of the investments needed to adapt the existing equipment to the use of natural gas instead of fuel oil, LPG or electricity (equipment listed in section A.4.3). The project occurs in furnaces, boilers and other equipments used in the process of iron casting, lamination and other thermal treatments as parts of steel bobbins production process. Only the fuel burners of the equipments were changed, therefore the equipments remains the same and the lifetime were not increased. The extra income and other non-measurable benefits derived from the sale of carbon credits and participation in the Kyoto Protocol are enough to make the conversion economically viable.

The project is helping the Host Country fulfil its goals of promoting sustainable development. Specifically, the project:

- Diminishes the atmospheric emissions of pollutants and improves the air quality of the region;
- Brings social benefits related to improvement of labour conditions;
- Creates new employment for the installation of the equipment
- Acts as a clean technology demonstration project which could be replicated across Brazil;

The Project Activity is an important capacity building activity, demonstrating the use of a new mechanism for funding environmentally friendly technologies, which reduces emissions of greenhouse gases.

A.3. Project participants:

Table 1 - Project participants

Name of party involved (*) ((host) indicates a host party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
Brazil (host country)	Aços Villares S.A	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Ltd.	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Brazil

A.4.1.2. Region/State/Province etc.:

South-eastern region - São Paulo State

A.4.1.3. City/Town/Community etc:

Pindamonhangaba city, Moreira Cesar district

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

Rod. Luiz Dumont Villares, km2, CEP 12442-260.
The plant is located very near the Via Dutra highway, responsible to connect the two biggest cities of Brazil, Rio de Janeiro and São Paulo.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

According to Appendix B of Simplified modalities and procedures for small scale CDM projects version 6, of 30 September 2005, the project activity is type AMS-III.B.

According to Annex A of the Kyoto Protocol, this project fits in Sectoral Category 4 (Manufacturing industries)

The project activity is a fuel switch program that is based on equipment fuel conversion. The conversion is related to adaptations and modifications in the fuel burners, allowing the consumption of natural gas instead of fuel oil, LPG or electricity in furnaces, boilers and other equipment used in the process of iron casting, lamination and other thermal treatments as parts of steel bobbins production process, more details see Annex 3. This process will not increase the lifetime of equipment, neither will it alter the production capacity significantly.

The existing equipment lifetime is expected to run well beyond the proposed crediting period, and will not be altered by the implementation of the project activity, given that the only modifications will be to change over the burners, not upgrade any other aspects of the equipment. The equipment is expected to have a remaining lifetime of more than 20 years, however for the purposes of CDM in this PDD is is only necessary to demonstrate that the existing equipment has a lifetime at least as long as the proposed crediting period. The equipment is expected to last at least 20 more years due to (1) the long lifetime of equipment in the industry as a whole, and the robustness of the equipment design, (2) strict maintenance procedures regulated by ISO standards, (3) the fact that a 25-yearly assessment of the boilers was done in December 2004 and pronounced the equipment to be in excellent condition, and (4) the fact that the fuel switch was a separate process not related to maintenance requirements or other retrofit activities. Evidence of this is given below:

(1) The long lifetime of equipment in the industry as a whole, and the robustness of the equipment design

The iron and steel sector is characterized by large capital investments leading to returns in the long term. That is, investments are made, expecting a return on investment over a period of up to 50 years. All the equipment used in this sector must be robust enough to function without needing to be replaced due to fatigue. The sector has more than 200 years of experience, and its technology is already mature.

The replacement of equipment in this sector is more closely related to advancements in technology rather than fatigue[1]. Moreover, equipment costs are very high, especially the opportunity costs of stopping production to replace or modify items of equipment. Hence, the company must avoid any unnecessary stoppages related to equipment fatigue.

(2) Strict maintenance procedures regulated by ISO standards

Iron and steel companies usually have very strict maintenance procedures. The Project Participant responsible for the plant operation is Aços Villares. Aços Villares is ISO 9000 certified (since before 2000). Given that Aços Villares' core business is the production of high quality and special steel, all maintenance actions are guided by strict quality standards adopted by the company. A continuous maintenance system to meet the highest quality standards is thus in place. During the fuel switch period all the equipment was in a very good condition and the fuel switch process is not related to a retrofit or maintenance processes. All the maintenance records since 2001 are available on site.

(3) The fact that a 25-yearly assessment of the boilers was done in December 2004 and pronounced the equipment to be in excellent condition

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[1] (http://www.worldsteel.org - International Iron and Steel Industry)

Boilers are very common pieces of equipment in the industry, and given the high pressures in the pipelines, the combustion chamber and the presence of fuel, boilers have very strict maintenance controls. According to the Brazilian government standards NR-13 from the Ministry of Labour, a boiler must have a biannual assessment and an entire evaluation of the equipment conditions once every 25 years. The 25 year evaluation was done in December 2004 and the plant is in perfect condition to continue operating. The biannual test prior to the fuel switch was done in 2002. According to these test results, the equipment was in good condition, and no major maintenance was required, only routine maintenance. No maintenance of fuel suppliers and/or fuel burners was required.

For the other equipment the Brazilian government does not have standards or obligatory procedures. The maintenance procedures are guided by the internal procedure developed in accordance with ISO 9000 standards. The internal maintenance procedure guide is called *Sistema de Gestão de Manutenção de Equipamentos* Villares SGM – 01 (Villares Equipment Maintenance Management System – SGM 01).

Based on these procedures, each part of equipment has a Maintenance Plan. All the maintenance plans, records and reports are stored in a database. As mentioned before, all these documents and database records are audited according to ISO standards, and are available to the validators.

All these procedures were implemented much before the fuel switch process, leading to high quality maintenance of the equipment. These high quality procedures result in long lifetimes of equipment, clearly demonstrating that the equipment, even using fuel oil, would have a lifetime longer than the crediting period (the first crediting period runs only until 2009).

(4) The fact that the fuel switch was a separate process not related to maintenance requirements or other retrofit activities

The fuel switch process was *not* considered as an internal maintenance activity in Villares, indicating that this process was not included in a broader maintenance program, since the equipment did not need additional maintenance. The fuel switch process was the responsibility of the instrumentation sector. It clearly demonstrates that the fuel switch process is not a result of or attached to another retrofit process.

In conclusion, the fuel switch from fuel oil to natural gas does not lead to an expansion of the equipment's lifetime nor does is it a result of a retrofit process. The equipment's lifetime, considering all implemented maintenance procedures, can be clearly demonstrated to extend beyond the first crediting period.

The project equipments are separated into different groups according to the operation, location and characteristics of each single item of equipment. The groups are presented in Table 2 below, for more information please see Annex 3.

Table 2 - Equipment groups

Equipment Group	Group Name	Equipment Name (internal)	Type	Number of equipments	Manufacturer	Model
1	C1	UP-710-1 to 4		4		
2	C2	UP-710-6/7/8	Hothouse	3	EUROTERM	Hank - proporcional
3	C3	UP-730-1 to 5		5		
4	C4	UP-530 -9/10/12		3		
5	C5 bur	UP-530-6	Furnace	1	Combustol	Carros
6	C5 lft	UP-530- 2/3/4/5		4		
7	C6 bur	UP-720-1 to 7	Furnace	7	RETHERM	Serie 600
8	M1	UP-300-1/2	Boiler	2	DEDINI	Keystone 11M
9	M2	UP-520-1/2/3/4/7	Heater	5	COMBUSTOL	MGO-103
10	M3	UP-600-1 to 10	Furnace	10	IHI - ISHIKAWAGIMA - HARIMA	Poço
11	M4	UP-600-12	Furnace	1	IHI - ISHIKAWAGIMA - HARIMA	Soleira movel
12	M5	UP- 600-13	Furnace	1	COMBUSTOL	Rolos Circulante
13	M6	UP-630-1 and 2	Furnace	2	BASIMET	BRASIMED

The project falls in the small scale methodology, since the emission reduction is less than 60 ktCO_2 per year. The estimation of project emissions during the crediting period is listed in Table 3, section A.4.3.1.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

The baseline is defined as the CO_2 emissions from the combustion of more carbon intensive fossil fuels in the equipment listed above, which occurs during the steel production processes. The project activity will reduce CO_2 emissions by replacing fuel oil, a more carbon intensive fuel, with natural gas, which is a less carbon intensive fuel.

According to the methodology, the Baseline Scenario is defined as the current (historical) use of fossil fuels in the existing facility up to the end of the crediting period without any retrofit to extend its capacity, its lifetime or to improve its fuel efficiency. That means, for this project activity the baseline is defined as the continued consumption of fuel oil, excluding any additional equipment or expansion.

According to AMS-III.B., no leakage calculation is required. The GHG emissions reduction are detailed in section A.4.3.1 and calculations presented in section E.

A.4.3. Estimated amount of emission reductions over the chosen crediting period:

Table 3 - Estimated Amount of Emission Reductions from the Project Activity

Years	Annual estimation of emissions reductions in tonnes of CO2
2003	14.397
2004	39.036
2005	45.025
2006	45.966
2007	45.966
2008	45.966
2009	45.966
total estimated reductions (tones of CO2)	282.322
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	40.332

A.4.4. Public funding of the small-scale project activity:

The project developer is not receiving any funding from Annex I parties.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to Appendix C to the simplified modalities and procedures for the small-scale CDM project activities, the project is not part of a larger CDM project activity. There is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants; and
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

This small scale fuel switch project is not part of a larger emission-reduction project given that this is a unique CDM project proposed by the Project developer in the south-east region of Brazil. Therefore, this project is not a debundled component of a larger project activity.

SECTION B. Application of a baseline and monitoring methodology:

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

- Methodology AMS- III.B. – Switching Fossil Fuels.

From *Appendix B* of Simplified Modalities and Procedures for small scale CDM projects version 10, 23 December 2006.

B.2 Justification of the choice of the Project Category :

The project activity is applicable to small-scale project type III.B. -Switching Fossil Fuels:

- Methodology AMS- III.B. – Switching Fossil Fuels.

The project attends to all of the applicability requirements required by AMS-III.B. This category comprises “Other Project Activity” sources such as fuel switch from fuel oil to natural gas.

Emission reductions will not exceed 60 ktCO_2e, please see Table 3.

Table 4 - Methodology requirements

Project Type	Type III – Other Project Activities.
Project Category	III. B. Switching fossil fuels.
Technology/Measure	This category comprises fossil fuel switching in existing industrial, residential, commercial, and institutional or electricity generation applications. Fuel switching may change efficiency as well. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this category. If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls in category II.D or II.E.
Boundary	The project boundary is the physical, geographical site where the fuel combustion affected by the fuel-switching measure occurs.
Baseline	The emission baseline is the current emissions of the facility expressed as emissions per unit of output (e.g., kg CO_2equ/kWh). Emission coefficients for the fuel used by the generating unit before and after the fuel switch are also needed. IPCC default values for emission coefficients may be used.

Leakage	No leakage calculation is required.
Monitoring	Monitoring shall involve: (a) Monitoring of the fuel use and output for an appropriate period (e.g., a few years, but records of fuel use may be used) prior to the fuel switch being implemented; (b) Monitoring fuel use and output after the fuel switch has been implemented - e.g. gas use and heat output by a district heating plant, gas use and electricity generated by a generating unit.

B.3. Description of the project boundary

The project boundary is the physical, geographical site where the fuel combustion affected by the fuel-switching measure occurs as stated by AMS- III.B.

The project site presents many buildings. The project boundary will consider only facilities that were using fuel oil in 2001 and 2002, thus affected by the fuel switch. The equipment to be considered are listed in section A.4.2.

Conforming to the guidelines and rules for small-scale project activities, the emissions related to production, transport and distribution of the fuel used in the power plants in the baseline are not included in the project boundary, as these do not occur at the physical and geographical site of the project.

B.4. Description of baseline scenario and its development:

The project activity involves a fuel switch to natural gas on equipment that historically utilised oil or LPG. Under the business as usual scenario there would be continued use of those energy sources. Without the fuel switch the boiler would continue to utilise fuel oil or LPG, and thus have GHG emissions based on the utilisation of fuel oil or LPG.

Following the Meth-Panel recommendation, the data used to demonstrate additionality was based on the period prior to decision-making. This means the years 2000, 2001 given that the decision was made in 2002, and the project activity started during the second half of 2002. For baseline calculations the data used is the most recent possible, meaning updated future plans, and any other recent applicable publications.

In order to demonstrate that Aços Villares took into consideration CDM financing in the implementation of the project, Aços Villares has a letter from the Purchase Department to the Industrial Director of Aços Villares issued on 12 June 2001 documenting the contacts and meeting with a gas company, a fuel oil company, and EcoSecurities (CDM consultancy) talking about the possibility of presenting the project as CDM project. Another letter from the President of Aços Villares was issued on 26 February 2002, approving the investment for switching the fuel oil to natural gas, and emphasizing the desire of Sidenor, the main shareholder of Aços Villares, to present the project as CDM project.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

According to *Attachment A* to *Appendix B* of the simplified modalities and procedures for CDM small scale project activities, evidence as to why the proposed project is additional can be shown by conducting an analysis of any of the following: (a) investment barriers, (b) technological barriers, (c) prevailing practice and (d) other barriers. Evidence to why the Project is additional is offered under the following categories of barrier: **(a) Investment/Financial barrier, (c) prevailing practice and (d) Other barriers**.

The first condition related to additionality is the demonstration of absence of mandatory policy or regulations requiring the fuel switch. The project activity meets this first requirement. There are no public politics requiring the fuel switch for the project developer or other companies in the sector or region. Moreover, all the environmental licenses do not present any requirements related to diminishing of air pollutants or more specifically, requirements for fuel switch.

(a) Investment/Financial Barrier:

The decision on fuel switching was made based on the average price of fuels in the two years before the fuel switch (2000 and 2001), in order to avoid an analysis based on instantaneous fluctuations in fuel prices. The fuel oil average price was 0.00759 R$/kJ while the natural gas price was 0.00856 R$/kJ and the LPG price was 0.01127 R$/kJ. The fuel switch from fuel oil to natural gas represents an increase of R$ 394,798 on the annual fuel bill. Although LPG was more expensive per kJ than natural gas, making switching away from LPG attractive in financial terms, switching to gas in the LPG-burning units alone would still have necessitated the initial investments to connect the plant to the natural gas supply system, . If only the LPG equipment were switched to natural gas the project NPV would be R$ 10,358,958 negative and the baseline NPV would be R$ 8,162,850, also negative. The difference between them would be R$ 2,196,107.97, negative, thus making this option economically unattractive; for more details, see Annex 3. Based on observations of fuel price variation, it was not possible to predict if the current price structure would change (see figure below). The fuel prices presented in the figure below were based on purchase receipts from the project developer.

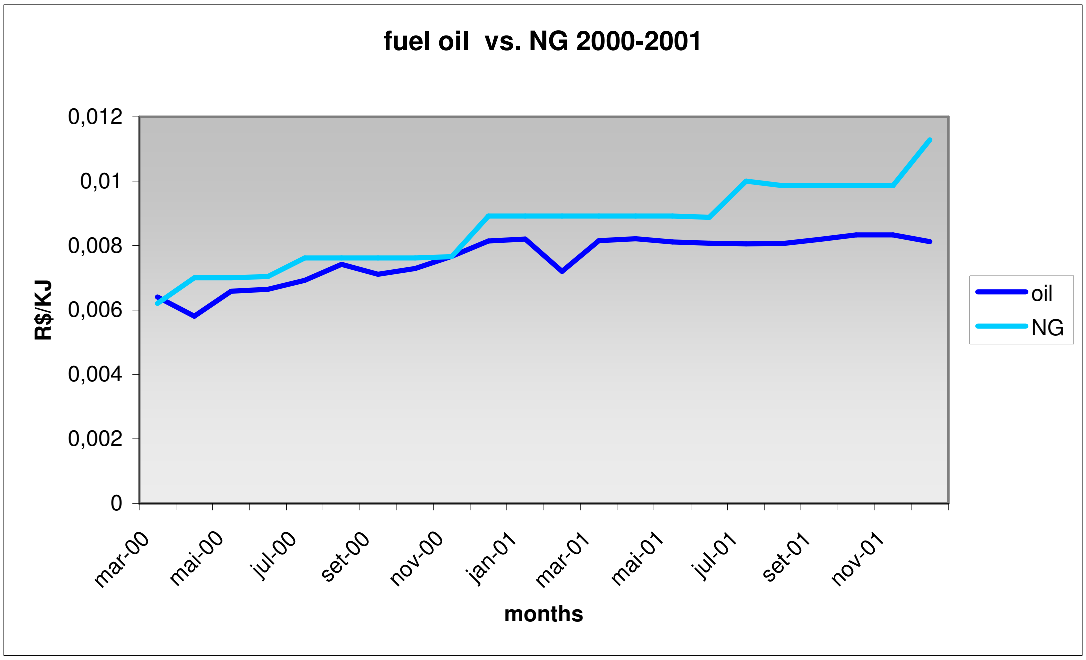

Figure 1 - Fuel and natural gas prices during period 2000 and 2001, prior to decision making.

Figure 1 includes only the fuel oil since it represents 89% of energy consumption. LPG represents 11% and electricity less than 1%. However, a sensitivity analysis including ALL fuel sources is given in detail below, and the project proponents are happy to give further details as requested.

Moreover, the fuel switch requires investments for connecting the plant to the gas supply pipeline, internal pipeline installation (including regulators, pumps and safety equipment), and equipment conversions from oil to gas. All these investments were estimated to sum approximately R$ 4,882,000.

Steel production, and consequently the revenue from production, will not be affected by the project activity. Therefore revenues are not included in the financial analysis. Instead, a comparison is done between the NPV of the baseline option (continuing to use oil) and the project activity (switch to natural gas). Considering the investments, operational costs differences, fuel prices and a discount rate of 18%, which is deemed reasonable since the government bond rate was around 19% in the year 2002 according to the Brazilian Central Bank, the project activity NPV is R$ - 57,794,075 (negative) without Carbon credits, while the baseline scenario NPV was R$ - 52,770,064 (negative). The baseline NVP minus project activity NPV is R$ - 5,024,016 (negative), indicating it is not economically viable to proceed with the project without CDM revenues.

To guarantee the consistency of the result, a sensitivity analysis was done with variations as presented in table 1 below, and even in these cases, the difference between baseline and project activity NPV was always negative.

Table 5 - Sensitivity Analysis

Parameter	Variation	Result (Baseline NPV minus project activity NPV)
Investment	Reduction of 50%	R$ - 2,955,071 (negative)
Natural gas prices	Decrease of 10%	R$ - 716,170 (negative)
Discount rate	Discount rate 3 times higher than default[2]	R$ - 3,576,128 (negative)

In order to be more transparent and conservative another sensitivity analysis of the impact of prices of natural gas, fuel oil, LPG and electricity on the economic viability of the project was done (see tables below).

Table 6 - Sensitivity analysis varying all the baseline and project fuel prices

		Fuel Oil Increase 0%	5%	10%
Natural Gas Decrease	0%	R$ (5,024,016)	R$ (3,332,646)	R$ (1,641,275)
	5%	R$ (2,870,093)	R$ (1,178,723)	R$ 512,648
	10%	R$ (716,170)	R$ 975,200	R$ 2,666,571

		LPG Increase 0%	5%	10%
Natural Gas Decrease	0%	R$ (5,024,016)	R$ (4,700,700)	R$ (4,377,383)
	5%	R$ (2,870,093)	R$ (2,546,776)	R$ (2,223,460)
	10%	R$ (716,170)	R$ (392,853)	R$ (69,537)

		Electricity Increase 0%	5%	10%
Natural Gas Decrease	0%	R$ (5,024,016)	R$ (4,948,571)	R$ (4,873,126)
	5%	R$ (2,870,093)	R$ (2,794,648)	R$ (2,719,203)
	10%	R$ (716,170)	R$ (640,725)	R$ (565,280)

N.B. red figures in brackets are negative numbers

To assume a decrease of 10% in the natural gas price represents a conservative approach considering the current trend of natural gas price at the time that the decision was taken. During this period the natural gas prices did not decrease, instead of that, it increased 81% during the two years.

The decrease of 10% of the fuel oil prices is also conservative. According to the graph presented above (figure 1), the fuel price increased 27% during the 2000 and 2001 period. The inflation during the same period was 19% according to the IGP-M index (source: IPEA DATA. IPEA is the Brazilian Applied

[2] With the parameters considered to perform this financial analysis the higher the discount rate, the better the project performs in the analysis.

Economy Research Institute). It means that the fuel oil price increased only 8% above inflation, while the sensitivity analysis considers an increase of 10%.

According to the results, it is clearly demonstrated that the use of natural gas is not a likely scenario. In an extreme situation, such as a decrease of natural gas prices (an unlikely scenario) and an increase of oil prices at a higher rate than inflation both at the same time, the use of natural gas is more attractive. However, this situation does not represent a likely scenario, thus, not the baseline scenario, given that both fuel prices are correlated (natural gas price changes tend to be related to the price changes of a bundle of petroleum fuels). It would have been highly risky for the project developer to build the project on the assumption that natural gas prices will fall by more than 10%, especially considering that the long term nature of the investment means that natural gas prices over the full lifespan of the project (over 20 years) would have to considered – and fuel prices this far into the future cannot be predicted with any certainty (other than to assume that the likely trend in fossil fuel prices is an *increase* due to contracting supply and growing demand). Considering the overall economic situation (high interest rates) as well as the fuel price trends, the most plausible scenario is the continuous consumption of fuel oil and other petroleum derivates.

(b) Prevailing Practice Barrier:

National and sectoral trends were analysed. According to Brazilian Energy Balance 2003, during the years 2000, 2001 and 2002 there was no significant increase in natural gas consumption, or decrease in fuel oil consumption in the iron and steel sector. The accentuated fuel oil consumption decrease happened during the 1990s (from 466 ktep in 1996 to 146 ktep 1999), but during 2000-2002 there was no significant decrease (changing only from 110 ktep to 106 ktep). The increase of natural gas consumption presents a similar pattern. It demonstrates that the most advantageous fuel switches already took place during the nineties (from 2.7% in 1990 to 5.1% in 2000), leaving only plants where natural gas was not available or was not economically viable.

Pindamonhangaba was one of first cities in the region to receive a natural gas supply, with natural gas being available since 1998 (http://www.pindamonhangaba.sp.gov.br/expansaoIndustrial.asp). However, the Pindamonhangaba plant started to use natural gas only in middle of 2002. Given the high prices of natural gas, and the consequent non-viability of a fuel switch, the switch was not done before, even with the fuel available. In other units, such as Mogi das Cruzes, where the fuel price structure was quite different than Pindamonhangaba unit, the fuel switch was done in 1997. The Pindamonhangaba is located very near Via Dutra highway, one of the best roads in Brazil, which significantly reduces transportation costs, lowering the price of fuel oil.

(c) Other Barriers:

The implementation of the project activity also faced a barrier related with securing the supply of Natural Gas. For the implementation of this project activity some important parts of the boiler were changed, so if there is a sudden interruption in the supply of natural gas the production would stop. That scenario would never happen if the project activity continued to use fuel oil, since it can be stored in larger quantities more easily and cheaply. Although interruptions in gas supply are likely to be rare, their possibility represents an additional risk associated with the project which reduces the perceived attractiveness of the investment in fuel switching. Interruptions in supply could come about for many reasons, for example:

- The natural gas that CEG commercialise is not 100% extracted in Brazil and it has a significant portion that is produced in Bolivia. Any changes in the political scenario in the Bolivian government could affect the distribution of gas (a similar scenario happened in the Graneros CDM project, when Argentina reduced the amount of gas supplied to Chile, and the project switched back to using coal)

- There could also be interruptions in gas supply due to replacement of the pipelines.

Therefore, it has been clearly demonstrated how the approval and registration of the project as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the barriers indicated above and thus enable the project to be undertaken. It can therefore be clearly demonstrated that the proposed CDM project activity is not the baseline scenario.

Table below summarises the results of the analysis regarding the barriers faced by each of the plausible scenarios.

Table 7 - Summary of Barriers Analysis

Barrier Evaluated		Scenario 1: continuation of the usage of fuel oil	Scenario 2: Implementation of the project activity with the fuel switch
a.	Financial / Economical	No	**Yes**
b.	Technical/Technologic	No	No
c.	Prevailing Business Practice	No	**Yes**
d.	Other Barriers	No	**Yes**

To conclude, the barrier analysis above has clearly shown that the most plausible scenario is scenario 1 (continuation of current practices). Therefore, the project scenario is not the same as the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As the fuel switch project uses natural gas as a source of energy used in the production of steel, the project emissions are calculated based on the consumption of natural gas required for the production of steel.

The formula used to calculate Project Emissions is:

$$PE = NG * EF_{NG} \qquad (1)$$

Where:

PE Is the Project Activity Emissions (in t CO_2)

NG Is the quantity of natural gas used in the project scenario (in m^3)

EF_{NG} Is the CO_2 emission factor per unit of natural gas associated with fuel combustion (e.g., tCO2/m³)

As the fuel switch project uses natural gas as a source of energy for steam generation used in the production of steel, the baseline emissions are calculated based on the amount of oil that would have been required for the production before the fuel switch.

The formula used to calculate the Baseline Emissions is:

$$BE_i = \frac{P}{r_i} \qquad (2)$$

Where:

BE_i Are Baseline emissions in the equipment group i
P Is the quantity of steel or steam produced (in t) per year
r_i Is the ratio of tons CO_2e per tonnes of steel or steam produced in the equipment group *i* in the baseline (from historical data)

The formula used to estimate the Emission Reduction is:

$$ER = BE - PE \qquad (3)$$

Where:

ER Emission reductions (tons of CO_2e)
BE Is the baseline emissions (in t CO_2)
PE Project activity emissions (tons of CO_2e)
Note: Total emission reductions are calculated using the actual consumption of natural gas and production of steel in 2003 to 2005, for 2006 and future years emission reduction was calculated using the average consumption based on first seven months of 2006.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**r_1**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 1 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.0744
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure

	quality.

Data / Parameter:	**r_2**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 2 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.2201
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	**r_3**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 3 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.2815
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	**r_4**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 4 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	1.0491
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure

	quality.

Data / Parameter:	$\mathbf{r_5}$
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 5 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.8508
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	$\mathbf{r_6}$
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 6 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.8739
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	$\mathbf{r_7}$
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 7 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.3511
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure

	quality.

Data / Parameter:	**r_8**
Data unit:	Tonnes of CO_2e per tonnes of steam
Description:	Is the ratio of tons CO_2e per tonnes of steam produced in the equipment group 8 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.2435
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	**r_9**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 9 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.0269
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	**r_{10}**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 10 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.0724
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure

	quality.

Data / Parameter:	**r_{11}**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 11 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.1226
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality.

Data / Parameter:	**r_{12}**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 12 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.0000
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and electricity consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure quality. This parameter is zero as a conservative measure.

Data / Parameter:	**r_{13}**
Data unit:	Tonnes of CO_2e per tonnes of steel
Description:	Is the ratio of tons CO_2e per tonnes of steel produced in the equipment group 13 in the baseline (from historical data)
Source of data used:	Project developer
Value applied:	0.1142
Justification of the choice of data or description of measurement methods and procedures actually applied :	This ratio was calculated based in the actual production and fuel consumption from at least one year previous to the project activity.
Any comment:	All data used in the calculations were subject to internal audits to assure

	quality.

Data / Parameter:	**EF_{NG}**
Data unit:	tCO_2/m^3
Description:	Emission factor of the natural gas
Source of data used:	Brazilian Energetic Balance 2005 and IPCC 2006
Value applied:	0.0021
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value was calculated as net calorific value of the natural gas in TJ/kt (source: Brazilian Energetic Balance 2005) times the carbon emission factor of the natural gas in tCO_2/TJ (source: IPCC 2006) times the natural gas density in tk/m³(source: Brazilian Energetic Balance 2005).
Any comment:	

Data / Parameter:	**EF_{Oil}**
Data unit:	tCO_2/t
Description:	Emission factor of the fuel oil
Source of data used:	Brazilian Energetic Balance and IPCC 2006
Value applied:	3.1064
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value was calculated as net calorific value of the fuel oil in TJ/kt (source: Brazilian Energetic Balance 2005) times the carbon emission factor of the fuel oil in tCO_2/TJ (source: IPCC 2006) divided by 1000.
Any comment:	

Data / Parameter:	**EF_{LPG}**
Data unit:	tCO_2/t
Description:	Emission factor of the LPG
Source of data used:	Brazilian Energetic Balance and IPCC 2006
Value applied:	2.9309
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value was calculated as net calorific value of the LPG in TJ/kt (source: Brazilian Energetic Balance 2005) times the carbon emission factor of the LPG in tCO_2/TJ (source: IPCC 2006) divided by 1000.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The emission reductions were calculated based on the calculation of ratios of tons of steel (or steam) produced by 1 ton of the energy source *i* used in the baseline (from historical data) for each equipment group. To calculate the ratios used to determine the fuel amount that would be consumed in the baseline the following method was used:

$$r_i = \frac{\sum_{1}^{n} \frac{BL_{j,i,k} * EF_j}{P_{i,k}}}{n}$$

Where,

r_i Is the ratio of tons of steel (or steam) produced by 1 ton of the energy source *i* used in the baseline (from historical data)
$BL_{j,I,k}$ Is the amount of energy source *j* consumed in the equipment group *i* in the month *k*
EF_j Is the emission factor of the energy source *j*
$P_{i,k}$ Is the amount of steel produced in the equipment group *i* in the month *k*
n Is the number of months used to calculate the ratio

The results obtained when applying the formula above are in the table below:

Equipment group (i)	Group Name	r_i
1	C1	0,0744
2	C2	0,2201
3	C3	0,2815
4	C4	1,0491
5	C5 bur	0,8508
6	C5 lft	0,8739
7	C6 bur	0,3511
8	M1	0,2435
9	M2	0,0269
10	M3	0,0724
11	M4	0,1226
12	M5	0,0000
13	M6	0,1142

The emission factors of the natural gas, fuel oil and LPG were calculated as following:

Fuel	Density - d	Net Calorific Value – NCV (TJ/kt)	Carbon Emission Factor – CEF (tCO_2/TJ)
Natural Gas	0.000623 t/m³	59.14	56.10
Fuel Oil		40.15	77.37
LPG		46.47	63.07

Parameter	Formula	Value
EF_{NG}	$= NCV_{NG} * CEF_{NG} * d_{NG}$	0.0021 tCO_2e/m^3
EF_{oil}	$= NCV_{Oil} * CEF_{Oil}/1000$	3.1064 tCO_2e/t
EF_{PLG}	$= NCV_{NG} * CEF_{NG}/1000$	2.9309 tCO_2e/t

Baseline emissions from the electricity consumption in Equipment Group 12 were considered to be zero for conservativeness.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of baseline emissions (tCO_2e)	Estimation of project activity emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2003	71.969	57.572	0	14.397
2004	147.727	108.692	0	39.036
2005	142.710	97.685	0	45.025
2006	142.327	96.361	0	45.966
2007	142.327	96.361	0	45.966
2008	142.327	96.361	0	45.966
2009	142.327	96.361	0	45.966
Total (tonnes of CO_2e)	931.713	649.391	0	282.322

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	P
Data unit:	Tonnes
Description:	Production of steel or steam in each equipment group
Source of data to be used:	Project developer Energy Balance report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The expected emission reduction calculation was based on the actual production of the plant. Please see Annex 3 for more information.
Description of measurement methods and procedures to be applied:	All data will be monitored continuously and registered in monthly reports that will be kept for the crediting period plus two years.
QA/QC procedures to be applied:	Measuring instruments will be maintained regularly and will be subject to internal audits. The quality assurance is considered under the ISO9000 standard of the company. Monitoring steel production is part of the core business.
Any comment:	

Data / Parameter:	NG
Data unit:	m³
Description:	Amount of natural gas used in each equipment group
Source of data to be used:	Project developer meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The expected emission reduction calculation was based on actual consumption of the plant. Please see Annex 3 for more information.
Description of measurement methods and procedures to be applied:	All data will be monitored continuously and registered in monthly reports that will be kept for the crediting period plus two years.
QA/QC procedures to be applied:	The department responsible for reading and recording data is the utility sector and this sector is the subject of internal audits done by the commission related to energy conservation - the CICE (Comissão Interna de Conservação de Energia). Meters will be maintained regularly. The consumption in each group can be cross checked with the total consumption of the area or building where the equipment is installed.
Any comment:	

B.7.2 Description of the monitoring plan:

1) Internal Organization

Pindamonhangaba unit is organized into two independent production centers: the Cylinders area and the Mechanical construction area. Each production center has many processes related to its production line. Each process is an independent sector, in many cases located in different buildings. Parallel to all processes there is the utility sector which provides services to all processes, and centralizes all information regarding fuel consumption.

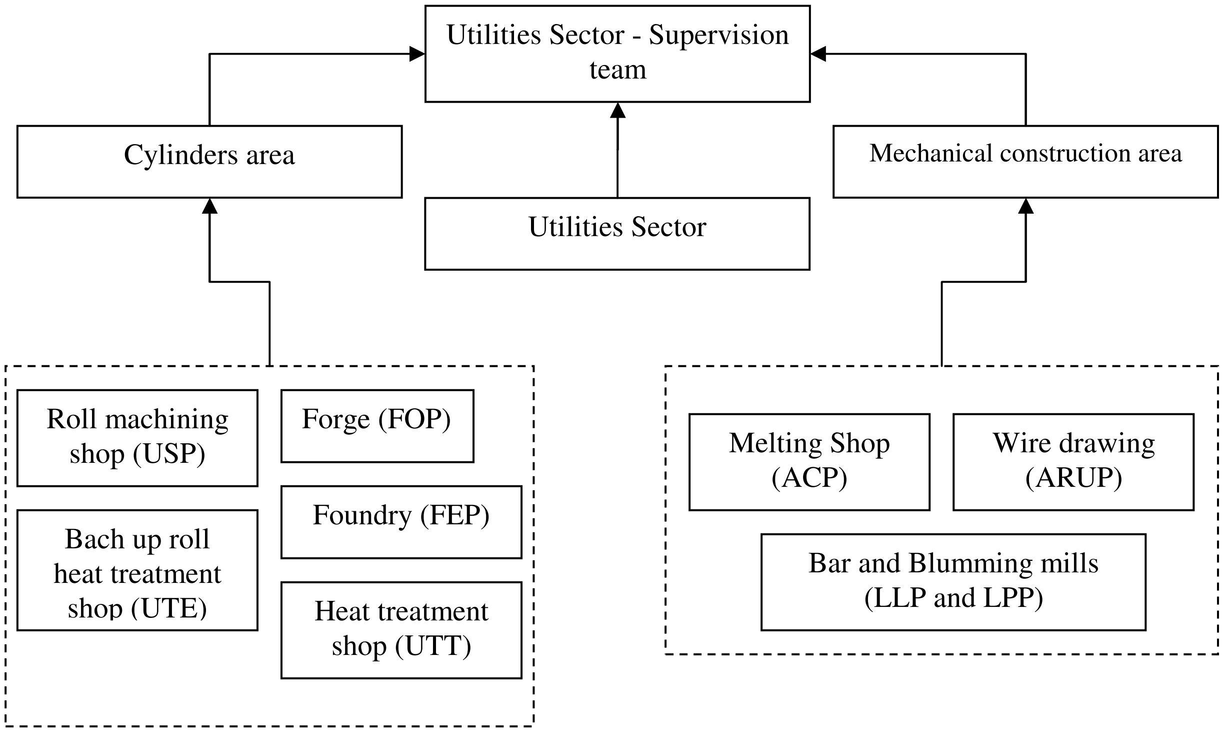

Figure A.4.3: Pindamonhangaba organization chart.

2) General Description of monitoring

Monitoring for the CDM project activity includes the monitoring of steel production and natural gas consumption, in the equipment included in the project boundary. Villares has an internal commission, formed by people from different departments related to energy conservation called the CICE (Comissão Interna de Conservação de Energia). This commission is responsible for optimizing operations, and for ensuring quality of monitoring procedures and data.

The Utilities sector is the department responsible for collecting and recording all monitoring data. All information about fuel consumption has been collected and reported by this department for a long time. All data will be stored both in electronic and paper formats.

3) Data Collection

Fuel consumption

During the last hours of the last day of each month, an operator reads all gas meters. The data collected is recorded in a paper sheet, specific for each area. During the morning of the next day, all data collected is transferred to the electronic system. During this transfer the data is checked by a second operator. If mistakes or discrepancies are detected, a new measurement is done, if necessary, as soon as possible. After all data in the electronic system has been entered correctly, it is validated by the area supervisor and then it is sent to the utility sector for “First data compilation and analysis”. Daily measurements are made as an internal control procedure. Data discrepancies can be detected by a simple comparison with measurements made during the previous days.

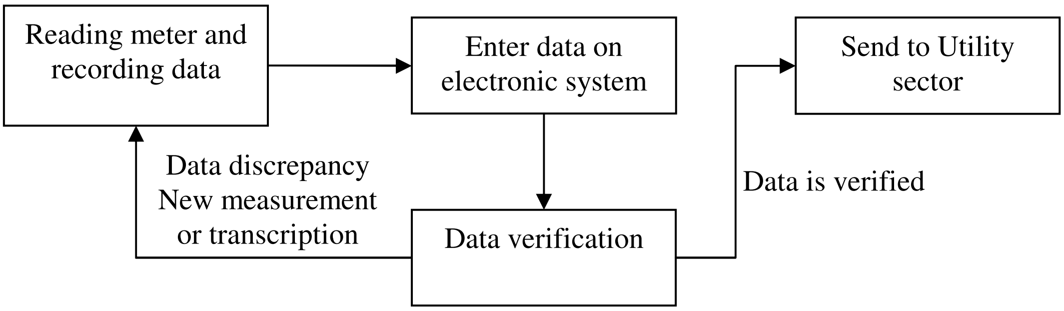

Figure A.4.2: Details of collecting and transferring data.

The "first data compilation and analysis" is the procedure related to receiving all data and cross-checking it with supplier data. There is one meter installed at the entrance to the company, which meters all natural gas coming into the Villares plant. Each individual sector has natural gas meters (usually more than one). The sum of all sectoral natural gas meters is cross-checked with the supplier natural gas meter which meters overall gas use at the plant. Steel and steam production will be manually measured in each equipment group, and data will be recorded daily in a paper sheet, specific for each area, by the area manager. This information will be reported to, and aggregated by, the utilities sector.

4) Reporting data

The Cost Report is written every month by the utility sector. It is compiled based on the "First data compilation and analysis", and reports fuel consumption for each item of equipment included in the project. This report is sent to the Cost Department, which checks all the information with the natural gas supplier invoices.

Steel production, steam production and fuel consumption are then combined into one report: The energy balance report, in the section specific for CDM, which is finished during the second week of each month and is subject for internal audits and ISO 9001 audits. It includes the fuel consumption (already revised by the Cost Department), and production of each sector. This report is send to CICE, who discuss the results in their meetings. The report is also divulgated to the CICE director, managers and collaborators. If there are no comments related to this report, the data will be added to the Annual Energy Balance Report. In case of comments and request of revisions, the report is revised before compilation of the Annual Energy Balance Report.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of conclusion: 04/01/2007
Person/entity determining the baseline methodology:

Leandro Noel - leandro.noel@ecosecurities.com
Pablo Fernandez - Pablo@ecosecurities.com

Person/entity determining the monitoring methodology:

Luis Filipe Kopp -kopp@ecosecurities.com

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

01/05/2002 (construction start)

C.1.2. Expected operational lifetime of the project activity:

More than 25 years

C.2. Choice of crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

01/01/2003

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D.: Environmental impacts:

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The environmental authority responsible for licensing the Villares activities is CETESB. It did not request any environmental study for the fuel switch. Environmental impact studies are requested only when the activity represents a significant impacts, thus there are no significant negative impacts related to project activity.

The environmental licences are:

Process number	Installation license	Operational / Final license	Description	Validity
03/00731/99	03000293	3000922	Regularization of the areas built without license	Without validity
03/0082/00	PU 1240/76		General beginning	Without validity
03/00183/05 (protocol number)			General renewal of the licenses	

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impacts are not considered significant

SECTION E. Stakeholders' comments:

E.1. Brief description of how comments by local stakeholders have been invited and compiled:

According to the Resolution #1 dated on December 2nd, 2003, from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima -CIMGC), decreed on July 7th, 1999[3], any CDM projects must send a letter with a description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Pindamonhangaba;
- Chamber of Pindamonhangaba;
- Environment agencies from the state and Local Authority;
- Brazilian Forum of NGOs;
- District Attorney (known in Portuguese as Ministério Público, i.e. the permanent institution essential for legal functions responsible for defending the legal order, democracy and social/individual interests) and;
- Local communities associations (FAMEDMOC – Federação das Associações de Moradores e Entidades Afins do Distrito de Moreira César).

Local stakeholders were invited to raise their concerns and provide comments on the project activity for a period of 30 days after receiving the letter of invitation. EcoSecurities and the project developer addressed questions raised by stakeholders during this period.

The letters were posted on 25 August 2005. An electronic copy of the PDD version 01 was available at: www.villares.com from 22 August 2005 to 30 September 2005. A written copy was sent as soon as requested.

E.2. Summary of the comments received:

Up to date one comment was received. The comment was made by Brazilian Forum of NGOs (Forum Brasileiro de ONGs e Movimentos sociais – FBOMS), emphasizing the favourable position to CDM project activities and the interest in cooperate and participate more during the CDM project cycle process.

E.3. Report on how due account was taken of any comments received:

The comment was not about the project scope neither the data nor approach used during the elaboration of PDD, thus no modification was made on project concept neither on this document.

[3] Source: http://www.mct.gov.br/clima/comunic/pdf/Resolução01p.pdf

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Aços Villares S.A
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Country:	Brazil
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URL:	www.villares.com.br
Represented by:	
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Salutation:	Mr.
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Middle Name:	Donizeti
First Name:	Edenilson
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Mobile:	
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Represented by:	
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First Name:	Pedro
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable

Annex 3

BASELINE INFORMATION

Data used to estimate the emission reduction

Output of each equipment group

Código/Code	1	2	3	4	5	6	7	8	9	10	11	12	13
eq. Group	C1	C2	C3	C4	C5 bur	C5 lft	C6 bur	M1	M2	M3	M4	M5	M6
unit	t	t	t	t	t	t	t	t steam	t	t	t	t	t
2003	33,609	23,735	9,356	0	6,507	9,248	0	0	287,796	150,788	239,458	30,544	0
2004	35,846	29,787	9,114	21,642	6,890	10,397	15,851	62,188	405,678	360,417	318,071	42,714	14,117
2005	38,861	32,700	9,316	24,956	7,431	10,965	18,299	64,185	388,544	287,464	272,564	45,829	10,594
2006 (Jan-Jul)	21,265	19,200	5,688	14,581	4,053	6,864	13,964	38,357	223,869	166,069	147,181	26,748	4,871

Fuel Consumption (m³)

Código/Code	1	2	3	4	5	6	7	8	9	10	11	12	13
eq. Group	C1	C2	C3	C4	C5 bur	C5 lft	C6 bur	M1	M2	M3	M4	M5	M6
2003	1,312,000	2,289,025	937,325	0	1,834,586	1,279,887	0	0	2,278,255	4,307,858	12,110,871	1,504,004	0
2004	1,581,745	3,182,577	963,772	7,058,632	1,296,076	1,442,899	1,769,552	5,081,023	3,120,373	10,191,916	14,100,056	1,886,284	911,002
2005	1,129,188	3,622,732	886,520	7,348,894	1,163,049	896,002	1,762,393	4,729,639	2,742,612	8,036,595	12,472,616	1,893,022	577,369
2006 (Jan-Jul)	540,851	1,737,074	565,460	4,209,359	663,901	563,155	1,218,025	2,927,602	2,002,457	4,688,058	6,721,361	1,069,762	287,891

Note: Total emission reduction is calculated using the actual consumption of natural gas and production of steel in 2003 to 2005, for 2006 and future years emission reduction was calculated using the average consumption based on first seven months of 2006.

Fuel data

Sources	density (kg/m³)	Source	lower heating value (kcal/kg)	Source	NCV (TJ/kton)	Source	Carbon oxidation (%)	Source	Carbon content (tC/TJ)	Source	Carbon Emission Factor (tCO2e/TJ)	Carbon Emission Factor (tCO2e/unit)	Fuel unit
fuel oil	1,000	[1]	9,590	[1]	40.15	[1]	100.0%	[2]	21.10	[2]	77.37	3.1064	ton
LPG	550	[1]	11,100	[1]	46.47	[1]	100.0%	[2]	17.20	[2]	63.07	2.9309	ton
natural gas	0.623	[4]	14,125	[1]	59.14	[1]	100.0%	[2]	15.30	[2]	56.10	0.0021	m³

Sources:

[1] Brasilian Energetic Balance,2005

[2] IPCC, 2006

[4] www.gasnet.com.br

	Value	unit	0 2.002	1 2.003	2 2.004	3 2.005	4 2.006	5 2.007	6 2.008	7 2.009
COSTS & INVESTMENT										
I) Investment		R$								
INVESTIMENTOS			(4.882.711)							1.464.813
Depreciation										
Residual value of new equipments										
TOTAL INVESTMENTS			**(4.882.711)**	**0**	**0**	**0**	**0**	**0**	**0**	**1.464.813**
II) Operational costs										
IIa) Baseline Costs										
Fuel oil Consumption		kJ	1.379.482.062	1.379.482.062	1.379.482.062	1.379.482.062	1.379.482.062	1.379.482.062	1.379.482.062	1.379.482.062
Fuel oil price	0,00759	R$/kJ								
Fuel oil Costs		R$	(10.472.531)	(10.472.531)	(10.472.531)	(10.472.531)	(10.472.531)	(10.472.531)	(10.472.531)	(10.472.531)
LPG Consumption		kJ	177.631.865	177.631.865	177.631.865	177.631.865	177.631.865	177.631.865	177.631.865	177.631.865
LPG prices	0,01127	R$/kJ								
LPG costs		R$	(2.001.893)	(2.001.893)	(2.001.893)	(2.001.893)	(2.001.893)	(2.001.893)	(2.001.893)	(2.001.893)
electricity consumption		MWh	3.893	3.893	3.893	3.893	3.893	3.893	3.893	3.893
Electricity price	120,00000	R$/MWh								
Electricity costs		R$	(467.136)	(467.136)	(467.136)	(467.136)	(467.136)	(467.136)	(467.136)	(467.136)
Total costs		**R$**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**
IIb) Project activity costs										
Fuel Consumption (NG)		kJ		1.557.127.941	1.557.127.941	1.557.127.941	1.557.127.941	1.557.127.941	1.557.127.941	1.557.127.941
Fuel price (NG)	0,00856	R$/kJ								
Fuel Costs (NG)		R$	0	(13.336.538)	(13.336.538)	(13.336.538)	(13.336.538)	(13.336.538)	(13.336.538)	(13.336.538)
Fuel oil, LPG and electricity costs		R$	(12.941.560)		0	0	0	0	0	0
Total costs		**R$**	**(12.941.560)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**
Natural Gas Cash Flow		**R$**	**(17.824.271)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(13.336.538)**	**(11.871.725)**
Oil Cash Flow		**R$**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**	**(12.941.560)**

		Oil	NG
Present Value at IRR	**18%**	**(R$ 52.770.064)**	**(R$ 57.794.080)**

Difference between them R$ (5.024.016)

Detailed financial analysis

LPG switch financial analysis

	Value	unit	0 2,002	1 2,003	2 2,004	3 2,005	4 2,006	5 2,007	6 2,008	7 2,009
COSTS & INVESTMENT										
I) Investment		R$								
INVESTIMENTOS			-4,882,711							1,464,813
Depreciation										
Residual value of new equipments										
TOTAL INVESTMENTS			**-4,882,711**	**0**	**0**	**0**	**0**	**0**	**0**	**1,464,813**
II) Operational costs										
IIa) Baseline Costs										
Fuel oil Consumption		kJ		0	0	0	0	0	0	0
Fuel oil price	0.00759	R$/kJ								
Fuel oil Costs		R$	0	0	0	0	0	0	0	0
LPG Consumption		kJ	177,631,865	177,631,865	177,631,865	177,631,865	177,631,865	177,631,865	177,631,865	177,631,865
LPG prices	0.01127	R$/kJ								
LPG costs		R$	-2,001,893	-2,001,893	-2,001,893	-2,001,893	-2,001,893	-2,001,893	-2,001,893	-2,001,893
electricity consumption		MWh		0	0	0	0	0	0	0
Electricity price	120.00000	R$/MWh								
Electricity costs		R$	0	0	0	0	0	0	0	0
Total costs		**R$**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**
IIb) Project activity costs										
Fuel Consumption (NG)		kJ		177,631,865	177,631,865	177,631,865	177,631,865	177,631,865	177,631,865	177,631,865
Fuel price (NG)	0.00856	R$/kJ								
Fuel Costs (NG)		R$	0	-1,521,387	-1,521,387	-1,521,387	-1,521,387	-1,521,387	-1,521,387	-1,521,387
Fuel oil, LPG and electricity costs		R$	-2,001,893	0	0	0	0	0	0	0
Total costs		**R$**	**-2,001,893**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**
Natural Gas Cash Flow		**R$**	**-6,884,604**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-1,521,387**	**-56,574**
Oil Cash Flow		**R$**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**	**-2,001,893**

		Oil	NG
Present Value at	**18%**	**(R$ 8,162,850)**	**(R$ 10,358,958)**

Financial Analysis data sources

	Parameter	Source
investments	Total Investments	Company data
energy prices	Natural gas price	Company data (obtained from suppliers). Average price of years 2000 and 2001
	Fuel oil price	Company data (obtained from suppliers). Average price of years 2000 and 2001
	LPG price	Company data (obtained from suppliers). Average price of years 2000 and 2001
	electricity	Market price
others	Discount rate	SELIC

Annex 4

MONITORING INFORMATION

Meters information

Natual gas flow meters						
area		Equipment	Nº	Manufacturer	Model	Serial number
FEP		**Geral do Prédio**	1	CONTECH	SVTG 2"	0212116
	UP-710-1	Aquecedor de Panela nº 1	Do not have exclusive flowmeter *			
	UP-710-2	Aquecedor de Panela nº 2	Do not have exclusive flowmeter *			
	UP-710-3	Aquecedor de Panela nº 3	Do not have exclusive flowmeter *			
	UP-710-4	Aquecedor de Panela nº 4	Do not have exclusive flowmeter *			
	UP-710-5	Forno 911	1	CONTECH	SVTG 37/25"	03050424
	913	Forno 913	1	CONTECH	SVTG 1.1/2"	0302204
	915	Forno 915	1	CONTECH	SVTG 1.1/2"	0302205
		Forno 927	1	ELSTER	QA2525GI	69150744/2004
		Forno 929	1	ELSTER	QA2525GI	69150745/2004
	UP-710-7	Estufa WR	1	CONTECH	SVTG 37/19"	03090048
	UP-710-8	Estufa Convencional	1	CONTECH	SVTG 1.1/2"	0302206
	UP-710-6	Estufa FHW	1	CONTECH	SVTG 1.1/2"	0302207
USP		**Geral do Prédio**	1	CONTECH	SVTG 1.1/2"	0302203
	UP-730-1	Forno 901	Do not have exclusive flowmeter *			
	UP-730-2	Forno 903	Do not have exclusive flowmeter *			
	UP-730-3	Forno 905	Do not have exclusive flowmeter *			
	UP-730-4	Forno 907	Do not have exclusive flowmeter *			
	UP-730-5	Forno 909	Do not have exclusive flowmeter *			
		Forno 917	1	ELSTER	QA2525G	69144633/2003
		Forno 919	1	ELSTER	QA2525G	69144629/2003
		Forno 921	1	ELSTER	QA2525G	69144631/2003
		Forno 923	1	ELSTER	QA2525G	69147116/2003
		Forno 925	1	ELSTER	QA2525G	69145409/2003
F.Poço	UP-600-1	Forno Poço 01	1	ELSTER	Q65DN50PN10	71034987/2002
	UP-600-2	Forno Poço 02	1	ELSTER	Q65DN50PN10	71034984/2002
	UP-600-3	Forno Poço 03	1	ELSTER	Q65DN50PN10	71034982/2002
	UP-600-4	Forno Poço 04	1	ELSTER	Q65DN50PN10	71034983/2002
	UP-600-5	Forno Poço 05	1	ELSTER	Q65DN50PN10	71034988/2002
	UP-600-6	Forno Poço 06	1	ELSTER	Q65DN50PN10	71034979/2002
	UP-600-7	Forno Poço 07	1	ELSTER	Q65DN50PN10	71034981/2002
	UP-600-8	Forno Poço 08	1	CONTECH	SVTG 1.1/2"	5010524
	UP-600-9	Forno Poço 09	1	ELSTER	Q65DN50PN10	71034985/2002
	UP-600-10	Forno Poço 10	1	ELSTER	Q65DN50PN10	71034986/2002
Acp	UP-520-1	Aquecedor panela 01	1	INSTRUMET	SMRIXG40	IB2060

	UP-520-2	Aquecedor panela 02	1	INSTRUMET	SMRIXG41	IB2075
	UP-520-5	Aquecedor panela 03	1	INSTRUMET	SMRIXG42	IB2073
		A .Panela Basauri 01	1	SCHLUMBERGE R	MTS60	06832
	UP-520-3	A .Panela Basauri 02	1	INSTRUMET	SMRIXG42	IB2071
	UP-520-4	A .Panela Basauri 03	1	INSTRUMET	SMRIXG43	IB2074
		A . Panela refrigerado		Aquecedor desativado		
	UP-520-7	A . Penela Ingener	1	INSTRUMET	SMRIXG42	IB2072
		A . Tundish 01		Do not have exclusive flowmeter		
		A . Tundish 02		Do not have exclusive flowmeter		
LLP	UP-600-12	Forno Viga Movel	1	ELSTER	Q650DN150PN10	73522750/2002
LLP	UP-600-11	Máquina Escarfagem	1	INSTRUMET	SMRI-Q65	182059
	UP-300-1	Caldeira A	1	ELSTER	QA2501007	69137053/2002
UTL	UP-300-2	Caldeira B	1	ELSTER	QA2501007	69137054/2002
ARUP	UP-630-1-2	Arames - Geral	1	CONTECH	SVTG 1 1/2	0212120
ACB	UP-600-13	Forno Barras	1	ACTARIS	FLUXI 2080	K5445417 03/A
	UP-720-1	Forno de Toto 612				
	UP-720-2	Forno de Toto 614				
	UP-720-3	Forno de Toto 616				
UTE	UP-720-4	Forno de Toto 618	1	Contech	SVTG2	0212114
	UP-720-5	Forno de Toto 620				
	UP-720-6	Forno de Toto 622				
	UP-720-7	Forno de Toto 628				
		Geral do Prédio	1	CONTECH	SVTG 4"	0110237
	UP-530-5	Forno de ToTo 624	Do not have exclusive flowmeter *			
	UP-530-4	Forno de ToTo 626	Do not have exclusive flowmeter *			
	UP-530-2	Forno de ToTo 630	Do not have exclusive flowmeter *			
FOP	UP-530-3	Forno de ToTo 632	Do not have exclusive flowmeter *			
	UP-530-6	Forno T1	1	ELSTER	Q250DN80PN10	71034398/2002
	UP-530-9	Forno F1	1	ELSTER	Q100DN80PN10	71031597/99
	UP-530-10	Forno F2	1	ELSTER	Q160DN80PN10	71034396/2002
	UP-530-12	Forno F 4	1	ELSTER	Q160DN80PN10	71034394/2002

* equipment that don't have exclusive flowmeter will be monitored using the difference between the total consumption of the building and the sum of all other equipments in the same building. This list considers more equipments than included in project activity.