Svilosa Biomass Project in Bulgaria

The wood industry is the second most important industry in Bulgaria in economic terms. Historically, the country was the wood-processing center for the former Soviet Union. Built in 1960, the *Svilosa Pulp Factory AD* became one of the largest wood industries in Bulgaria, located in the northern part of the country, on the banks of the river Danube. In 1999, the plant was privatized. Nearly 85% of its production, which primarily comprises three wooden products, is exported: historically to Central and Eastern European countries, but since its privatization also to Western Europe and Turkey.

Historically, the biomass waste of the factory was dumped due to the relative low costs involved. The dumped waste has accumulated into hundreds of thousands of tonnes stockpiled wood waste. Recently, the discussion focused on using the biomass as a fuel, thereby replacing coal. However, access to new technology and long-term finance has been a problem thus far. The contribution of the World Bank's Prototype Carbon Fund (PCF) should overcome these problems.

Project description

In the current situation the Svilosa plant uses a coal-fired boiler to produce heat for the cellulose-production and power for the production process. The JI project at hand will install a new biomass boiler – running on wood waste from the production process and stockpiled wood waste – which will partly replace the current coal-fired boiler. This project involves a total investment of US$ 2.75 m. The project was endorsed by the Bulgarian Ministry of Environment and Water on 4 May 2001.

The project will reduce emissions coming from three sources, two of which are measurable. The measurable reductions are attributable to the replacement in part of the coal-fired boiler with a biomass boiler (reduction of CO_2) and to the firing of stockpiled wood waste (reduction of methane emissions). The N_2O that is emitted through the process of wood decomposition and low temperature spontaneous combustion cannot be measured. Figure 1 gives an overview of the project situation.

The new biomass boiler has an expected output from 2004 onwards of 117 GWh/yr. The total project emission reductions over a 9-year crediting period (2004-2012) are estimated to equal 897,293 t CO_2-eq. (2004-07: 311,293 t CO_2-eq.; 2008-12: 586,000 t CO_2-eq., see table 1).

Baseline determination

When defining the baseline scenario, initially the option of multi-project baselines was investigated. Such a baseline, based on national energy models and benchmarking at various levels of aggregation, could be used to derive national benchmarks for the projects' different emission sources. However, the application of multi-project baselines proved to be too difficult at Svilosa. The main reason was that, because of the two different sources of emission reductions, a national benchmark was difficult to derive. The project developers, therefore, used a project-specific approach.

Three possible approaches to defining the baseline scenario were considered: investment/financial analysis, control groups, and scenario analyses. The first approach calculates the internal rates of return for all possible alternative project scenario's. For the Svilosa project three scenario's were analyzed: 'business-as-usual (BAU)', co-firing coal and biomass, and fuel switch from coal to gas. In this approach, the most financially viable option will be used as a baseline scenario.

The second approach defines a control group, an area or company comparable in character to the project area. Such a 'proxy' site will be monitored for developments that occur in the absence of the project. Also future macro-economic developments in the region and – which is especially relevant for Svilosa – future changes in the waste management legislation in Bulgaria are analyzed for the control group. Naturally, this approach cannot be used to calculate a baseline emission scenario beforehand.

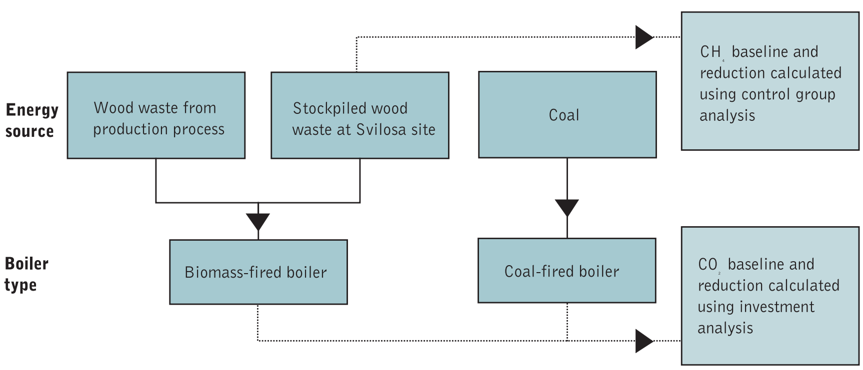
The third approach, the scenario analysis, is applicable in the PCF model in cases where no data is available for the application of the other two approaches. After identification of all plausible scenarios for the project site, the most likely scenario will be selected based on an analysis of subjective factors like external risks, costs, market demand, revenues, political environment, and other relevant factors. Because of the qualitative nature of this approach – it is very difficult to quantify the parameters that influence the calculation – transparency is one of its main problems.

For Svilosa the investment/financial analysis was considered most suitable to define the baseline scenario. Additionally, the control group approach was used to monitor Svilosa's methane emission reductions.

Investment analysis

In the investment analysis a number of scenarios were considered, some more plausible than others. Three plausible scenario's – BAU, integration of biomass boiler (proposed project), and switch to natural gas – were used in the calculation of net present values (NPVs). The analysis showed the biomass boiler had the second-best NPV, differing relatively little from the BAU-scenario. (Over the period 2002-12 the relative NPVs were (negative) US$ 52,091,857 for BAU and US$ 53,570,778 for biomass.) The switch to natural gas showed the highest cost scenario, generating a negative NPV of more than US$ 100 m. When calculating the NPV, a sensitivity analysis was done of the two most likely scenarios, BAU and biomass. This analysis showed that either the installation costs of the biomass boiler had to fall by over 60% or the coal price had to rise by 54% to generate the same NPV for both options. Such price fluctuations were considered unlikely, which made the BAU-scenario the most appropriate baseline-scenario for the fuel-switch component of the project.

Figure 1. Svilosa project situation



Control group analysis

After having established the baseline scenario for the waste management part of the project – the firing of stockpiled wood waste – and the resulting methane emission reductions, an extra safeguard was implemented in the monitoring system in the form of a control group analysis. Depositing wood waste at Svilosa as it is done under the current legal framework cannot continue after Bulgaria has incorporated the *Acquis Communautaire*, as part of the EU pre-accession process, in its national legislation. The *Acquis* proscribes that wood waste has to be deposited in landfill sites. For Bulgaria, however, studies show that it is highly unlikely that compliance with the *Acquis* legislation will be forced upon industry sites exactly by 2007 (when Bulgarian entrance to the EU is expected). Rather, the directive is expected to be gradually implemented in the 5 to 10 years following 2007 in a transition arrangement.

Defining a control group was rather difficult as Svilosa cannot be compared to another factory in Bulgaria in terms of size, stockpiling behavior (*e.g.* on private grounds), and comparable nature of stockpiled material (*e.g.* organic and non-hazardous). Therefore, a set of criteria was defined which could be applied to the whole wood industry sector. Companies meeting these criteria (*i.e.* company operates in Bulgaria, has existing waste stockpiles, consisting of organic non-hazardous waste, which is deposited on private grounds) will be monitored with a view to the (among other things, legislative) developments regarding the handling of stockpiled wood waste. Based upon the information supplied by the Ministry of Environment on the developments of the methane emissions from these sites, the baseline for the methane emissions at Svilosa can subsequently be adjusted accordingly on a year-to-year basis.


Svilosa pulp factory

Leakage

Emission increases outside the project boundaries are described as leakage. For the Svilosa project four possible sources of leakage were analyzed.

A first leakage factor is the electricity supplied to the grid. The current coal-fired boiler produces a mix of heat and power that is different from the heat and power mix in the new project situation, as the installation of the new biomass boiler will lower heat demand from the coal-fired boiler. Leakage could occur if the old boiler would continue to produce the same amount of power and sell it to the grid. However, currently the excess power produced by the old boiler is sold to the grid at a price below the production price, and therefore this is not considered a likely option. Furthermore, the Ministry of Environment prohibits the production of energy at the Svilosa site with the sole purpose of supplying it to the grid.

A second leakage factor is transportation. The implementation of the biomass boiler will have a positive leakage effect on transportation. The wood waste currently gets transported over a 1.5 km track to the waste stockpile. In the new situation this transport will no longer be necessary as the waste will be fed straight into the boiler.

A third possibility of leakage comes from the harvesting of wood. However, no leakage effects are expected here as the wood demand at Svilosa is production driven (biomass is a waste product at Svilosa) and not energy demand driven. Furthermore, all production wood currently comes from sustainably managed forests in Bulgaria.

A last source of leakage possibility analyzed is coal. However, all coal related emissions are handled in the baseline and no leakage is expected here.

For further information, please contact:
Mr. Rumen Vitkov
Svilosa AD
5253 Svishtov
Bulgaria
e-mail: vitkov@svilosa.bg

Mr. Benoît Bosquet
Prototype Carbon Fund (PCF)
World Bank
Washington, D.C., USA
e-mail: bbosquet@worldbank.org
Internet: www.prototypecarbonfund.org

Table 1. Overview of emission reductions from coal displacement and CH_4 avoidance at Svilosa

Annual Summary	Units	2004	2005	2006	2007	2008	2009	2010	2011	2012
Heat output from biomass boiler	MWh	117,114	117,791	117,791	117,791	117,791	117,791	117,791	117,791	117,791
Consumption of process wood	tonnes	25,760	46,836	46,836	46,836	46,836	46,836	46,836	46,836	46,836
Consumption of stockpile wood	tonnes	33,600	17,989	17,989	17,989	17,989	17,989	17,989	17,989	17,989
Saved coal consumption	tonnes	22,468	22,598	22,598	22,598	22,598	22,598	22,598	22,598	22,598
CO_2-eq. emission reduction										
CO_2 due to coal replacement	t CO_2	46,846	47,116	47,116	47,116	47,116	47,116	47,116	47,116	47,116
CH_4 from process wood	t CO_2-eq.	4,422	12,286	19,793	26,949	33,783	40,332	46,587	52,557	58,269
CH_4 from stockpile wood	t CO_2-eq.	4,292	6,405	8,419	10,334	12,197	13,939	15,629	17,245	18,786
Total Emissions reductions	t CO_2-eq.	55,560	65,807	75,328	84,400	93,097	101,388	109,333	116,918	124,172