JOINT IMPLEMENTATION
PROJECT DESIGN DOCUMENT

CONTENTS

SECTION A. GENERAL DESCRIPTION OF THE PROJECT ACTIVITY

A.1. Title of the project activity:

"Energy efficiency investment programme at Svilocell Pulp Mill".

A.2. Description of the project activity:

Purpose of the project is the implementation of a series of energy efficiency measures to reduce Company's energy consumptions and greenhouse gas emissions.

Svilocell is a wood processing Company whose main final products is sulphate bleached pulp[1].

The owner of Sulpfate Bleached Pulp Mill, which is the production site where the energy efficiency measures are to be implemented, has set-up a new registered trademark called Svilocell Co. that took over the operations of Svilosa.

The Company has developed a long term investment programme to increase energy effectiveness of its operations, to comply with forthcoming EU environmental requirements and to increase the pulp production capacity to meet its customers' increased demand.

This objective is guided by the Company's strategy to become a leading industry player in the Balkans and to strengthen its competitive position in South East Europe through the increased economies of scale following the capacity increase and modernisation of its production process.

The first phase of the programme consists of increasing annual pulp production capacity from the current 55,000 to 110,000 ton and making the necessary investment to reduce energy consumption through improvements of its energy efficiency level.

This Project Design Document (PDD) is provided for the purpose of the registration of a series of energy efficiency projects at the Svilocell Pulp Mill in Svishtov, Bulgaria, as Joint Implementation (JI) project, under Art. 6 of the Kyoto Protocol (KP).

The overall objective of the JI project is to generate Emission Reduction Units (ERUs) reducing about 682,143 tonnes of CO_2 in the period 2008-2012 and Assigned Amount Units (AAUs) reducing emissions about 85,840 tonnes of CO_2 in2007.

Based on the Memorandum of Understanding on co-operation between the Kingdom of the Netherlands and the Republic of Bulgaria in reducing emissions of greenhouse gases under

[1] Bleached Sulphate Pulp is produced by cooking wood chips in pressure vessels in the presence of sodium hydroxide (soda) liquor. Bleached pulp is particularly used for graphic papers, tissue and carton boards.

article 6 of the KP the proposed energy efficiency Joint Implementation project aims at reduction of greenhouse gases due to: (i) reduction of steam and electricity usage; (ii) more efficient generation of steam and electricity. The measures and the energy savings are shortly described below. More information is provided in the following sections.

- Replacement of cyclone evaporator with a new super concentrator for Soda Recovery Boiler (SRB) - this measure will result in energy savings of about 55,000 MWh per year;
- Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor and installation of new filters - this measure will result in energy savings of about 47,000 MWh per year;
- Installation of frequency control drives on electric motors - this measure will result in energy savings of almost 1,300 MWh per year;
- Installation of a back pressure steam turbine - this measure will result in energy savings of about 40,000 MWh per year;
- Installation of a blow down heat recovery system - this measure will result in energy savings of about 4,000 MWh per year;
- Shift of production from pulp blocks to pulp sheets - this measure will result in energy savings of 46,000 MWh per year.

The cost for the energy efficiency programme is estimated close € 8,5 million. An overview of the investment cost associated with the energy efficiency investment programme is given in table A.3 of section A.4.4.

Svilocell offer a good opportunity to demonstrate how emission reduction units (ERUs) from JI under the Kyoto Protocol can stimulate improvements in reducing energy consumptions and improving environmental performance.

A.3. Project participants:

Project Company	Svilocell Co. 5253 Svishtov Bulgaria URL: www.svilosa.bg Contact person: Mr. Iliyan Illarionov, Executive Director phone: +359 631 31636 fax: +359 631 31141 e-mail: illarionov@svilosa.bg

Lender Lender	European Bank for Reconstruction and Development 17 Moskovska Street 1000 Sofia Bulgaria URL: www.ebrd.com Contact person: Mr. Tero Halmari, Senior Banker phone: +359 2 9321 402 fax: +359 2 9321 441 e-mail: Halmarit@sof.ebrd.com
Expected Carbon Credits Purchaser	European Bank for Reconstruction and Development (for the account of the Netherlands) One Exchange Square London EC2A 2JN, United Kingdom URL: www.ebrd.com/carbonfinance Contact person: Mr. Egbert Liese, Manager Netherlands-EBRD Carbon Fund Phone: +44 20 7338 7177 Fax: +44 20 7338 6942 E-mail: liesee@ebrd.com

Table A.1: Project participants

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party:

Bulgaria

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

Company: Svilocell

Address: Republic of Bulgaria

Svishtov 5253;

A.4.1.3. City/Town/Community etc:

Svilocell is situated 3.5 km northwest of Svishtov. The figure below indicates the site location of Svilocell Pulp Mill.

Figure A.1: Site location

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity:

Svilocell pulp mill is located on a 172 hectares site in northern Bulgaria near the town of Svishtov, on the banks of the river Danube, which provides transportation access for the import of wood and for the export of finished goods.

The Company is one of the very few market pulp producers in south-eastern Europe and it is very well positioned to take greater advantage of a market because of its excellent location, efficient transportation links with relevant markets, cheap and abundant supply of the major raw material – wood.

The company infrastructure is well developed and has the following basic characteristics:

- The company has its own port on the Danube which allows the efficient transportation and forwarding of raw materials and finished products.
- The company uses its own railway network, railway station and loading and unloading equipment.
- Direct links by railway and road with the major industrial centres in Bulgaria, Europe and the Middle East.

Figure A.2: Svilocell port on Danube

A.4.2. Type and category of the project activity:

The methodology addresses the energy efficiency and fuel switch

A.4.3. Technology of the project activity:

The technologies proposed are proven and therefore no major bottlenecks are expected with the implementation. Company has its own workshop and trained staff for the implementation of the Project. Some implementation will be done by the equipment supplier.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The following explanation is based on the UNFCCC document: "Tool for the demonstration and assessment of additionality". This guideline provides for a step-wise approach to demonstrate and assess additionality of the Project Activity. These steps include:

- Step 1: Identification of alternatives to the project activity;
- Step 2: Investment analysis; or
- Step 3: Barriers analysis;
- Step 4: Common practice analysis; and
- Step 5: Impact of registration of the proposed project activity as a JI project activity.

These guidelines are applicable to this Energy Efficiency project as it provides a general framework for demonstrating and assessing additionality. For the situation of the Energy

Efficiency Investment Program at Svilocell Pulp Mill these guidelines were applied, by using step 3 (barrier Analysis) and not step 2.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

The global BHKP production capacity is about 25 million tonnes per annum, of which Svilocell's share is approximately 0.21%. The biggest BHKP producing countries are Brazil, Indonesia, USA and Canada (see table below). The large production capacity in Brazil and in Indonesia is based on their massive raw material resources – mainly eucalyptus in Brazil and acacia and mixed tropical hardwood in Indonesia. Due to recent investments in these two countries, they are looking very competitive in terms of average mill capacity and age.

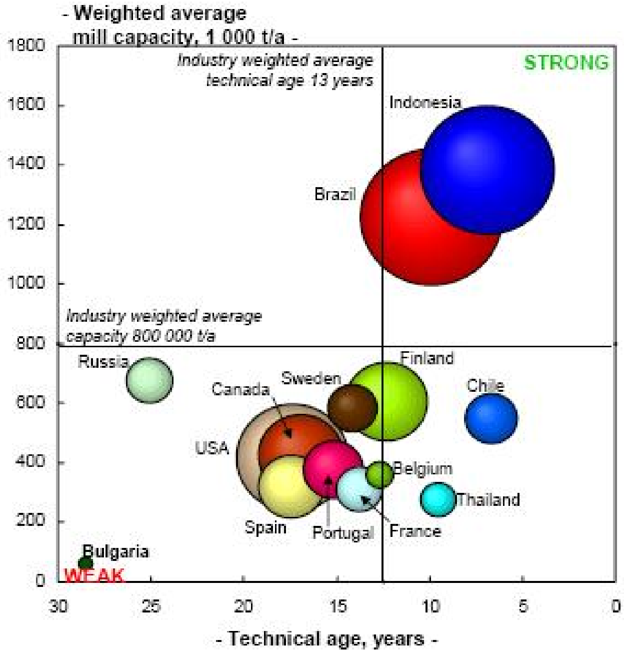

Figure A.3: Selected global BHKP Producers by country

The biggest European producer of BHKP is Finland followed by Spain, Portugal and Sweden. The total market BHKP capacity of European producers is approximately 6.5 million tonnes per annum (about 25% of global capacity), with Svilocell's share being less than 1%. Figure below lists the largest global market BHKP producers and their total production capacities.

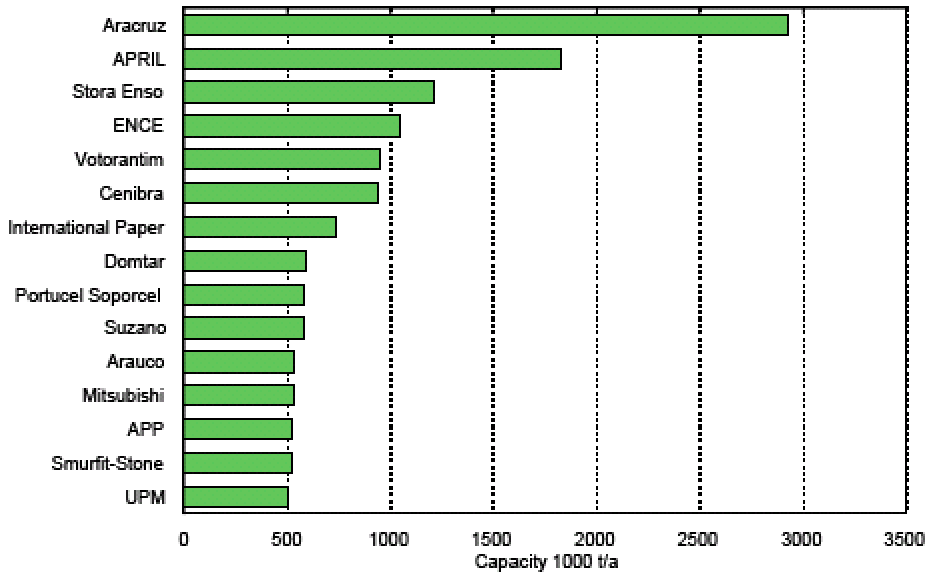

Figure A.4: Main BHKP Market Pulp Producers

Svilosa was built in the late 1960s to be a major industrial complex, situated on the Danube.

Currently the Company's annual nominal pulp production capacity stands at 55,000 ton. Svilosa was privatised successfully in 1999, and since then exports have increased, and the factory has turned a profit every year.

With the current annual production the Company is just a small producer in Europe, where the BHKP market size is approximately 8 million tons and the average annual growth is about 150,000 tons/annum. Svilocell is not competing locally as it is exporting some 95% of its production, mainly to neighbouring countries and Western Europe. The nature of the market pulp business is global, with most of the trade being cross border and even between continents.

The Company aims to double the capacity of the plant to 110,000 tonnes per annum, as defined in the "Project Engineering and Implementation Plan", prepared by Svilocell for the pulp mill expansion project in December 2005, and in which a design input of 110,000 ton/year total pulp production is considered[2].

To increase the production capacity the company will need to invest. Furthermore, it will need to do Environmental Investments to comply with Environmental regulations. Alternative Scenario is therefore based on a doubling of capacity and compliance with Environmental regulations, under capital availability constrain.

[2] The "Project Engineering and Implementation Plan" is confidential, but available to Validator on request.

Table A.2 shows the investment required to double production capacity and represents the Business As Usual Investment Program. Depending on the availability of funds Company would only have invested €18.7 million that are strictly required to achieve the planned production capacity and some environmental projects. This program does not include the Energy Efficiency Project Activity.

Measure Description	EUR
Reconstruction of Soda Recovery Boiler	8,170,000
Caustization and lime regeneration	1,004,000
Wood handling department	839,000
Installation for collecting and incineration of malodorous gasses	395,000
Capacity increase of the ClO_2 installation	420,000
Fibre line	4,212,000
Environmental projects	2,340,000
Unallocated	1,378,000
TOTAL	18,758,000

Table A.2: BAU Investment Programme

As mentioned above, the company needs to invest to comply with environmental requirements, imposed by the Bulgarian Government due to possible entrance of Bulgaria to the EU. However none of the energy efficiency measures proposed is connected to environmental constraints and is critical to environmental compliance with existing and forthcoming legislations after Bulgarian 2007 EU accession. The planned improvements would bring the mill to compliance with the national norms and would basically represent BAT.

Step 2. Investment analysis

This step was not applied to show additionality of the project activity as Step 3 was deemed more applicable to the type of project.

Step 3. Barrier analysis

Svilocell is contemplating to implement a much larger investment program of approximately €48.7 million[3]. The overall investment programme is focused on increasing the output of the plant to the planned level and to increase the quality of the product to a level which enables Svilocell to maintain competitiveness on national and international markets. This overall investment plan includes about € 8,5 million on Energy Efficiency investments (See table A.3).

[3] Overall investment plan is available to the validator on request.

The Company started 2003 to select main suppliers, but the Energy Efficiency projects have not been started due to lack of funds.

Measure Description	EUR
Replacement of cyclone evaporator with a new super concentrator for SRB	1,240,000
Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor	1,470,000
Installation of frequency control drives on electric motors	42,000
Installation of a back pressure steam turbine	3,500,000
Installation of a blow down heat recovery system	40,000
Shift of production from pulp blocks to pulp sheets	2,150,000
TOTAL	8,442,000

Table A.3: EE Project Investment Programme[4]

For such a relatively large investment program of €48.7 million, the company needs access to long term financing, which would allow availability of capital. However for a company like Svilocell, access to long term financing is normally not available. Table A.4 shows a selection of large loans in Bulgaria.

Signing date	Borrower Full Name	Borr Bus	Amt (€ mm)	Mty (yrs)	Arranger
Aug 2005	GloBul (mobile operator)	Telecoms	75	3	BACREDIT
Apr 2005	Bulgarian Telecom (to replace EBRD loan) at the holding company level	Telecoms	400	5 3	BACREDT, CITIGR, EFGERG, INGBANK
Jul 2004	Boliari	Agri-business	12	7	EBRD
Jun 2004	Bulgarian Telecom	Telecoms	73 123	7 5	EBRD
May 2004	MobilTel EAD	Telecoms	450 200	5 1	ABNAM, ING CITIGR, RBS, RZB, BAWAG, BULPOST
Apr 2004	OpetAygaz JSC (sponsors' guarantee)	Oil & Gas	32	8	EBRD
Oct 2003	Maritza East III Power Co	Power & Energy	347.8	12 - 15	EBRD
Jul 2002	Cosmo Bulgaria Mobile EAD	Telecoms	70	0.5	AUSTRIA, UNIBUL
Apr 2002	Munic. of Sofia – Public Transport	Public Tranport	20 15	10 8	EBRD
Dec 2001	Sofia Water System	Water	31	15	EBRD
Aug 2001	Balkanpharma	Pharmaceutical.	22.5	4.5	EBRD

Table A.4: Selection of large loans in Bulgaria

The Company started a negotiation with the EBRD to access long-term loans. Nevertheless, most of the large and long term investments in Bulgaria are done in other sectors (mainly

[4] All investment plan is available to the validator at request.

telecoms). Investments in Pulp and Paper sector in Bulgaria, has been proven risky to the EBRD[5].

Main risk is a secure income stream for debt service. This is mainly due to the prices for Pulp. These prices are forecasted to go down and are relatively volatile. See Figure A.5, below.

Furthermore, the main cost for pulp is wood. Prices in Bulgaria are at present relatively low, but it is unclear what will happen with these prices in the future. Main driver for higher wood prices is an increase in wood demand. Bulgaria aims to support generation of renewable energy by setting up a green certificate system. This might trigger Power Plants to co-fire biomass and increase demand for wood.

Debt service of a large loan for such a long period in the Pulp and Paper Sector is risky. In case of heavy weather, the company might not be able to generate sufficient cash flows. Svilocell is mainly owned by a local entrepreneur[6], which compared to other companies mentioned on Table A.4, does not have deep pockets to guarantee payments to lenders, in case of bad weather.

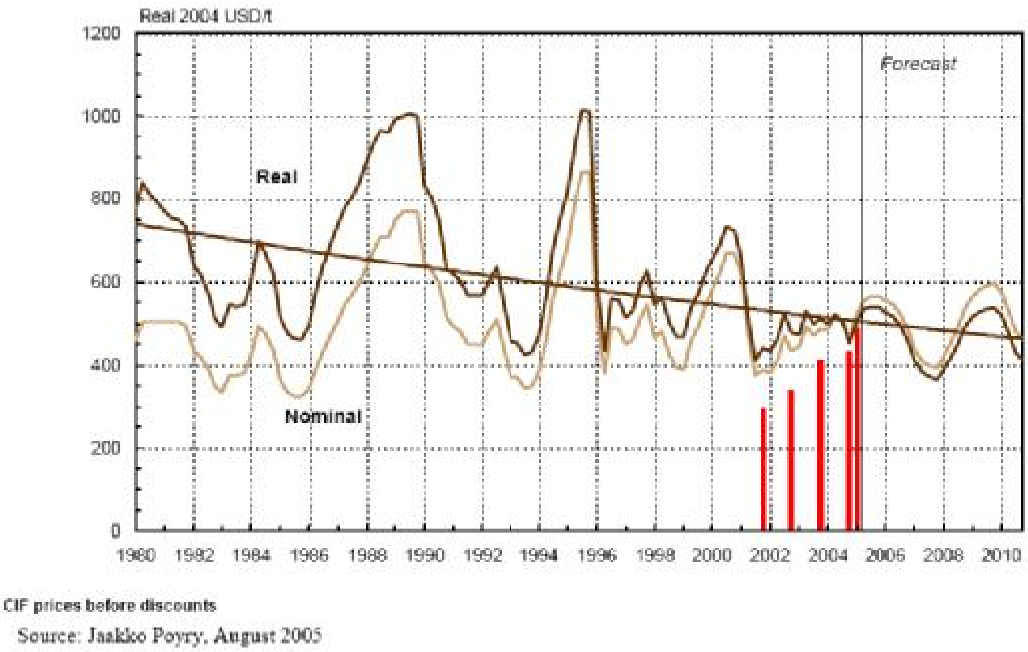

Figure A.5: Price of BHKP (mixed southern) in 1980-2010

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[5] EBRD and IFC financed an investment program at Celhart, a paper factory in Bulgaria. The company went bankrupt in 2001. See also: www.sofiaecho.com/article/celhart-struggles-for-survival/id_1394/catid_23

[6] www.svilosa.bg

Step 4. Common practice analysis

The Company, and therefore the Project, is very specific due to location and product. Nevertheless, Paper Factory Stambolijski (PFS) is a similar Company producing mainly Sack Paper. This company has developed a similar investment program for which it obtained formal JI status and signed an ERPA end of 2004.[7]

Step 5. Impact of JI registration

The Company and EBRD agreed on a financing plan (see Table A.5 below). Of the total € 48.7 million, EBRD agreed on a Senior Loan (under A/B structure[8]) of € 28 million, with a tenor of 10 years[9]. The EBRD required that, in order to finance further measures (already identified in 2003 and not implemented due to lack of funds) to reduce energy consumptions, carbon credits were generated under a JI project. To that purpose, EBRD required an independent energy audit, which was undertaken in June 2005, to assess that the funds required to EBRD to implement the energy efficiency measures and the consequent savings associated to those measures were correctly estimated.

As result of this process the capital investments to implement the energy efficiency measures confirmed during the audit have been included in the loan agreement with the EBRD. The energy efficiency investment programme amounts to approximately €9 million (see Table A.3, above).

Source	€ Million	%
EBRD (A/B structure)	28	58
Other funds[10]	20.7	42
TOTAL	48.7	100

Table A.5: Financing plan

As shown in Table A.5 Svilocell has €20.7 million available from other funds and therefore the €18.8 million required to increase the production to the planned 110,000 ton/year (see table A.2) would be available even without the EBRD funds.

The key issue which must be resolved for the energy efficiency projects to proceed, is therefore the availability of funds, which is directly linked to the approval of the Joint Implementation project. To mitigate the Debt service of the additional loan for the energy efficiency measures to EBRD, the returns of the Carbon Credits will serve as a cushion. This

[7] www2.moew.government.bg/recent_doc/international/climate/proekti_eng.doc

[8] Of the €28 million, €10 has been syndicated with the Nordic Investment Bank.

[9] Loan Agreement is confidential, but available to Validator on request.

[10] Inclusive expected advance payment for sale of Carbon Credits.

cushion has been formalised in the Loan Agreement by restricting the use of payments for Carbon Credits[11].

A.4.4.1 Estimated amount of emission reductions over the crediting period:

The project is expected to reduce about 770,000 tonnes of CO_2 equivalent in the period till 2012 (inclusive). The reductions are based on:- (i) reduction of steam and electricity usage; and (ii) more efficient generation of steam and electricity. The energy efficiency measures, the energy savings and the emission reductions are shortly described in the table below. More information is provided in the following sections.

#	Measure Description	Energy Savings MWh/yr	tCO_2 Reduction in Crediting Period
SVP-01	Replacement of cyclone evaporator with a new super concentrator for SRB	54,524	215,719
SVP-02	Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor	46,689	184,721
SVP-03	Installation of frequency control drives on electric motors	1,271	6,938
SVP-04	Installation of a back pressure steam turbine	39,878	217,847
SVP-05	Installation of a blow down heat recovery system	3,749	12,825
SVP-06	Shift of production from pulp blocks to pulp sheets	45,950	129,933
	Total	192,061	767,983

Table A.6: Overview of investment and reduction

Table below shows emission reductions through years

	UoM	2007	2008	2009	2010	2011	2012	Total
CO_2 emissions reduction	$tC0_2$	85,840	143,608	137,200	135,136	134,267	131,932	767,983

Table A.7: Overview emission reduction over the years

SECTION B. Application of a baseline methodology:

B.1. Title and reference of the baseline methodology applied to the project activity:

No approved CDM baseline methodologies fully applicable to the project activity are available; therefore the approach for baseline methodology has been developed by the project proponent at paragraph B.3 and within each specific sub-project.

[11] Loan Agreement is confidential, but available to Validator on request.

However, reference to the following CDM Approved Baseline Methodologies has been applied, where applicable

- AM0018 "Baseline Methodology for Steam Optimization Systems"
- AM0024 "Baseline Methodology for GHGs reduction through waste heat recovery and utilization for power generation at cement plants";

B.2. Project category applicable to the project activity:

The chosen methodology is designed for project activities aimed at: energy efficiency, energy saving and power generation.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered JI project activity:

The overall Energy Efficiency Program includes six measures. Each of these measures is described in section B.3.3.

B.3.1 Key factors analysis

The baseline and project GHG emissions are evaluated on a series of key factors, which could have the potential to affect the baseline development, the project activity level and therefore the GHG emissions or that could represent potential risks for the project.

These key factors can be distinguished at three levels:

- Off-site key factors that can not be influenced by the project;
- Off-site key factors that can be influenced by the project;
- On site key factors.

Project and baseline emissions are mainly determined by the key factors that are exposed below:

- Activity level (production level to be achieved in the next years);
- Capital availability (energy efficiency programme will permit to obtain funds that cover a part of overall investment; the sale of Carbon Credit will increase the return of investment);
- Economic factors (improvement of the current cost structure, ability on ensuring a steady cash-flow return);

- Fuel availability (use of cleaner energy sources)
- Technical factors (engineering solutions for production expansion);
- Employees training (skills, knowledge and cultural behaviour)
- Impact of implementation of EU Directives after 2007 Bulgaria accession to EU

All these key factors are analyzed in the section below and consideration about the most likely scenarios in absence of the JI project are elaborated.

B.3.2 Construction of the baseline scenario

The baseline scenario is the scenario that reasonably represents the GHG emissions that will occur in the absence of the proposed JI project activity.

According to the key factors, potential scenarios are discussed and the baseline scenario is selected.

B.3.2.1. Activity level

Regarding the production factors two baseline scenarios are considered:

(1) Business as Usual (BAU) scenario (60,000 t/yr);

(2) Pulp Mill expansion project scenario (110,000 t/yr).

According to investigation done by Svilocell Management under the BAU scenario, if nothing is done, there is a risk of closure of the mill in the medium term, due to lack of competitiveness resulting from low production capacity and high energy costs per unit of production.

A design basis in existing plants is not quite uniform, but a likely production level to be achieved in the expansion is 110,000 t/yr; a "worst case" scenario could be something like 100,000 t/yr and a "best case" at about 120,000 t/yr".

The "Project Engineering and Implementation Plan", prepared by Svilocell for the pulp mill expansion project in December 2005, uses as design input a total pulp production of 110,000 ton/year[12].

In order to be consistent, the same production level was used for the estimation of baseline emissions and project emissions.

[12] The "Project Engineering and Implementation Plan" is confidential, but available to Validator on request.

Therefore baseline scenario (2) "Pulp Mill expansion project scenario (110,000 t/yr)" is the most likely scenario.

B.3.2.2. Capital availability

Regarding the capital availability two baseline scenarios are considered:

(1) Funding is available for the overall proposed project (expansion + energy efficiency);

(2) Funding is available for the expansion without implementing EE measures.

As explained in section A.4.4, the key issue which must be resolved for the energy efficiency measures to proceed, is the availability of funds, which is directly linked to the approval of the Joint Implementation project. The EBRD loan with AB structure with ten years tenor inclusive of the carbon credit are used to decrease credit risk associated to a possible increase in price of wood or a possible decrease of the final pulp price.

According to that it can be concluded that without the approval of the JI project funding for the implementation of the energy efficiency measures would not be available.

Therefore baseline scenario (2) "Funding is available for the expansion without implementing energy efficiency measures" is the most likely scenario.

B.3.2.3. Economic factors

Regarding the economic factors two baseline scenarios are considered:

(1) The implementation of the energy efficiency measures, within the overall expansion project, will better improve the profitability of the facility;

(2) The implementation of the expansion project, without the energy efficiency measures, will better improve the profitability of the facility

The investment programme is focused on increasing the output of the plant to the planned level and to increase the quality of the product to a level which enables Svilocell to maintain competitiveness on national and international markets.

The energy efficiency measures will improve the profitability of the Company if including the funds and returns from the sale of the carbon credits associates to the JI project. Only in this case it is expected to generate enough income to satisfy debt service and return on equity.

In absence of income generated from the revenue from carbon credit, the profitability of the facility, being the return on investment of energy efficiency measures, on average, highest than investment projects related to capacity expansion, would be better in absence of the energy efficiency projects.

Therefore baseline scenario (2) "The implementation of the expansion project, without the energy efficiency measures, will better improve the profitability of the facility" is the most likely scenario.

B.3.2.4. Fuel availability

Regarding fuel availability at Svilocell two baseline scenarios are considered:

(1) Cleaner energy sources can be used on site without impacting the Company's profit;

(2) Use of coal will remain the most profitable alternative up to 2012.

Coal is delivered from the Ukraine by boat on the Danube River and is unloaded at the company's port. Due to the Bulgarian energy situation, and especially the remote location of Svishtov, alternative energy sources are not and will not be available at competitive prices, at least in a medium term period. There are not national plan to bring the natural gas to Svishtov region and therefore it is unlikely that different energy sources will be available in Svilocell until 2012.

Currently natural gas supplies 17.6 % of Bulgaria's primary energy consumption. Bulgaria's energy authorities (the Ministry of Energy and Energy Resources) foresee that this level of consumption will remain stable over the next 15 years.

In 1996 with assistance from Wintershall AG and Bulgargas, when the CHP was still owned by Svilocell, it was investigated the potential for switching the CHP from coal to gas. The conclusion of the feasibility study was that the Svilocell would have incurred three sets of costs:

- The CHP would require US$ 4 million of capital investment onsite to switch to gas;
- Svilocell would have to pay for the construction of a 38km gas connection to the nearest transmission point. The cost of the gas connection was estimated in 1996 to be US$ 2.6 million based on an estimate of US$ 70 per meter of pipeline – the cost for such a pipeline has gone up considerably since the 1996 quote; and,

- Switching from imported coal to gas would also entail increased fuel costs, as currently the bulk price of natural gas (on the main pipeline) is US$13.5/MWh[13] compared to the current price of US$4.75/MWh paid by Svilocell for imported coal.

National policy favours strong energy self-sufficiency, and considerable investment is underway and planned in exploiting local coal (e.g., the major electricity expansion taking place in Maritsa, South East Bulgaria, using Bulgaria's lignite reserves).

There are currently no plans to extend this pipeline to Svishtov, and the Ministry of Energy and Energy Resources' policy is to optimize the trans-shipment of natural gas to neighbouring countries (Turkey, Greece, Macedonia, Yugoslavia) to generate maximum foreign exchange revenues, and utilize natural gas only in strategic areas requiring atmospheric emissions reductions (primarily in district heating systems and in urban areas).

Therefore baseline scenario (2) "Use of coal will remain the most profitable alternative up to 2012" is the most likely scenario.

B.3.2.5. Technical factors

Regarding the technical factors two baseline scenarios are considered:

(1) The production capacity will be doubled through the expansion on the existing lines;

(2) The production capacity will be doubled by constructing an entirely new line.

Pulp mill was constructed in 1971 to produce 40,000 t/yr, and since then it passed through upgrading and modernization to increase production up to current capacity of 55,000 ton/yr. Despite part of the equipment are aged, from a technical point of view, according to analysis done by Svilocell, it is more profitable doubling the capacity of the facility through improvements on the existing line than building a totally new line and dismissing the present equipment and production facilities.

Therefore baseline scenario (1) "The production capacity will be doubled through the expansion of the existing lines" is the most likely scenario.

B.3.2.6. Employees training

It is important that the energy experts and all other employees involved in energy management are aware of the relevance of an energy efficiency programme and are well trained on how they can contribute to reduce energy consumptions and improve energy efficiency.

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[13] Recent quote for Industrial Client in well connected industrial area in Sofia, and below the average industrial price for industrial users from January 2001 to present (Ministry of Energy and Energy Resources, Economics

This approach will result in shifting from a "project by project" to a "programme" approach. The "programme" approach will drive energy efficiency and savings throughout project delivery, through efficient assessment, prioritization, implementation, and completion of activities. The overall process is aimed at developing an efficient management and creating positive influences to streamline activities.

Regarding training opportunities in energy management two baseline scenarios are considered:

(1) The energy management training is implemented thanks to capital included in the funds for the implementation of the energy efficiency measures;
(2) Without energy efficiency measures, the energy management training is not implemented due to lack of capital.

Svilocell and EBRD agreed to finance the Energy Management Training for its employees. The EBRD welcome the initiative and is evaluating the possibility to promote and finance the training programme through funds made available by the Central European Initiatives (CEI). Should the energy efficiency measures not be implemented due to lack of funds, the energy management training is less likely to be undertaken as well.

Therefore, in accordance to consideration made with regard to capital availability, baseline scenario (2) "Without energy efficiency measures, the energy management training is not implemented due to lack of capital" is the most likely scenario.

B.3.2.7. Impact of implementation of EU Directives after 2007 Bulgaria accession to EU

According to the Svilocell engineering plan for the expansion of the pulp mill, thank to the energy efficiency measures implemented on the soda recovery boiler, its production will increase up to 550,000 MWh/year. Consequence of will be a reduction of the steam demand that is currently supplied from the nearby thermal power plant. This lack of steam demand could result in an alteration of the current operating configuration and efficiency of the power plant. Two baseline scenarios are considered:

(1) The reduction of steam demand from Svilocell will influence the thermal power plant operations;
(2) The reduction of steam demand from Svilocell will not influence the thermal power plant operations.

In order to meet the requirements of the Directive 2001/80/EC on the restriction of some air pollutants released from large combustion power plants, the Bulgarian Government has developed a programme for the implementation of the above mentioned Directive.

Department, May 2002).

The study, published in March 2003[14], assess all national power plants potentially affected by the Directive and identify the required technical solutions to meet the requirements of the Directive. The measure identified for Svilosa power plant to achieve the standards of the Directive is the restriction of the thermal output to 312 MW_{th} before 2008 (out of 624 MW_{th} currently installed), to be achieved by shutting down two of the four units in operation at present. It is therefore very likely that its overall production efficiency will decrease and the CO2 emission factor will deteriorate after 2007.

It is evident that the Svilosa thermal power plant will face important changes in its operation in order to comply with EU Directive on pollutants emissions and therefore the reduction of steam demand from Svilocell, will not have influence at all on the operating configuration and efficiency of the power plant. The measures for achievement of standards required by the Directive have been already defined and are to be implemented before 2007, with a total investment cost estimated in € 10 million. The rehabilitation of the power plant is not foreseen before 2018.

The implementation of other EU Directives at Pulp Mill, after 2007 Bulgaria accession to EU, will not directly affect the energy efficiency project in any way.

Therefore baseline scenario (2) "The reduction of steam demand from Svilocell will not influence the thermal power plant operations" is the most likely scenario.

B.3.2.8. Summary of identified baseline scenario

Based on the analysis of key factors the baseline scenario (which represent the most likely development scenario in absence of the JI project) is summarized as following:

- Pulp Mill expansion project scenario (110,000 t/a);
- Funding is available for the expansion without implementing energy efficiency measures;
- The implementation of the expansion project, without the energy efficiency measures, will better improve the profitability of the facility;
- Use of coal will remain the most profitable alternative up to 2012;
- The production capacity will be doubled through the expansion on the existing lines;
- Without energy efficiency measures, the energy management training is not implemented due to lack of capital;
- The reduction of steam demand from Svilocell will not influence the thermal power plant operations.

[14] Republic of Bulgaria "*Program for implementation of Directive 2001/80/EC on the restriction of some air pollutants released from large combustion plants*", March 2003, Sofia.

B.3.3 Identification of baseline scenario specific to each energy efficiency measure

Svilocell purchases electricity from the grid and part of required steam from a coal fired combined heat and power plant (CHP), which was divested from the company in 2003. The remaining steam is supplied to the production process from waste black liquor from the soda recovery boiler (SRB) and from a 14 MW biomass boiler (also called the bark boiler), which utilises the bark, chips and sawdust from the debarking process.

Figures B.1 and B.2 respectively show the historical trend of energy consumptions at Svilocell's site and the breakdown by energy source in 2004.

From 2002 energy consumptions are in the range 550 GWh per year.

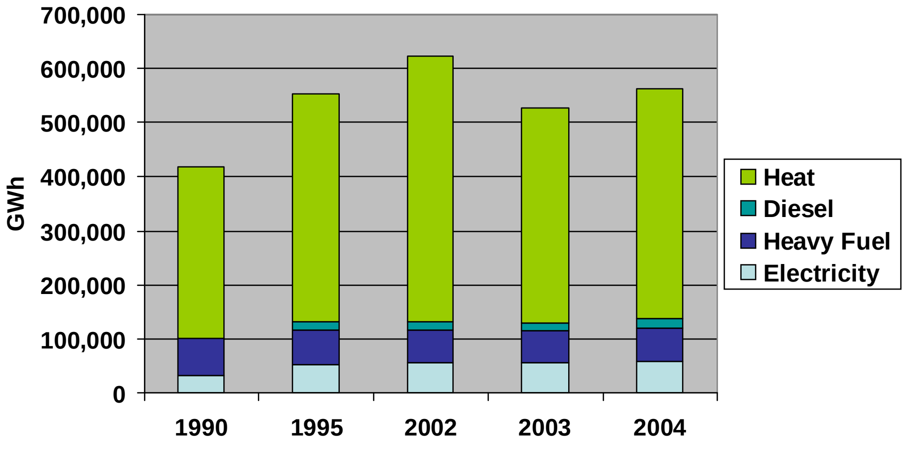


Figure B.1: Trend of energy consumption by source

The breakdown by energy source shows that 75% of total consumptions are due to heat purchased by the power plant, while electricity and heavy fuel oil represents 11% of total consumptions.

About 70% of total heat consumption is generated on site by a recovery boiler fed with 335 tDS per day of thick black liquor and by a 14 MW biomass-fired boiler, which uses the bark, chips and sawdust from the debarking process.

The remaining 30% is purchased from the coal-fired Combined Heat and Power (CHP) plant, located nearby.

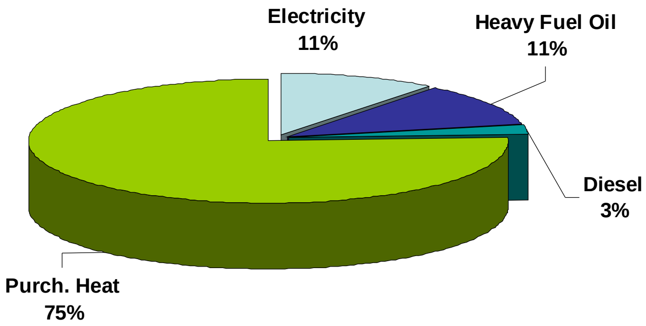


Figure B.2: Breakdown of energy consumption by source

The electricity is purchased from the national grid while the coal is imported from Ukraine

The heavy fuel only is mainly used for the CMC process, which is not part of the project boundaries because none of the energy efficiency measures are implemented in that area. Only a small fraction, which amount to less than 1% of total energy used by the SRB, is consumed for start-up operations of the SRB, which have a frequency of two, three times per year.

Having been sold to a totally separated and independent legal entity, Svilocell does not have any type of control on the CHP. Upon request, Svilocell receive at the end of the year a written certificate, signed and stamped by CHP management, in which are reported the following data:

- Steam purchased
- Calorific value of coal
- Coal emission factor based on fuel input
- Thermal efficiency of the CHP

The data relative to year 2004 were used in elaborating the energy efficiency measures and in calculating baseline emissions.

B.3.3.1 Replacement of cyclone evaporator with a new super concentrator for black liquor in Soda Recovery Boiler (SRB) – SVP-01

Source

No approved baseline methodologies fully applicable to the project activity are available; therefore this approach for baseline methodology has been developed by the project proponent. It takes anyway reference to the Approved Baseline Methodology AM0018

"Baseline Methodology for Steam Optimization Systems", where applicable to the project activity.

Selected approach from paragraph 48 of the CDM modalities and procedures

The baseline methodology deemed most appropriate for the project activity is:

(a) "Existing actual or historical emissions as applicable".

Option (a) is most suitable because historical data of energy performance are available and, compared to options (b) and (c), it represent the most conservative and accurate option and it is also the easiest one to be monitored.

Applicability:

This methodology is applicable to these project activities: (SVP-01) "replacement of cyclone evaporator with a new super concentrator for black liquor in Soda Recovery Boiler (SRB)", (SVP-02) "replacement of barometric condensers with plate heat exchangers in evaporating systems for black liquor", (SVP-05) "Installation of a blow down heat recovery system".

The methodology was used under the following conditions:

§ The steam produced is used within the pulp mill where the proposed project activities are located. Remaining steam need is supplied by the power plant.

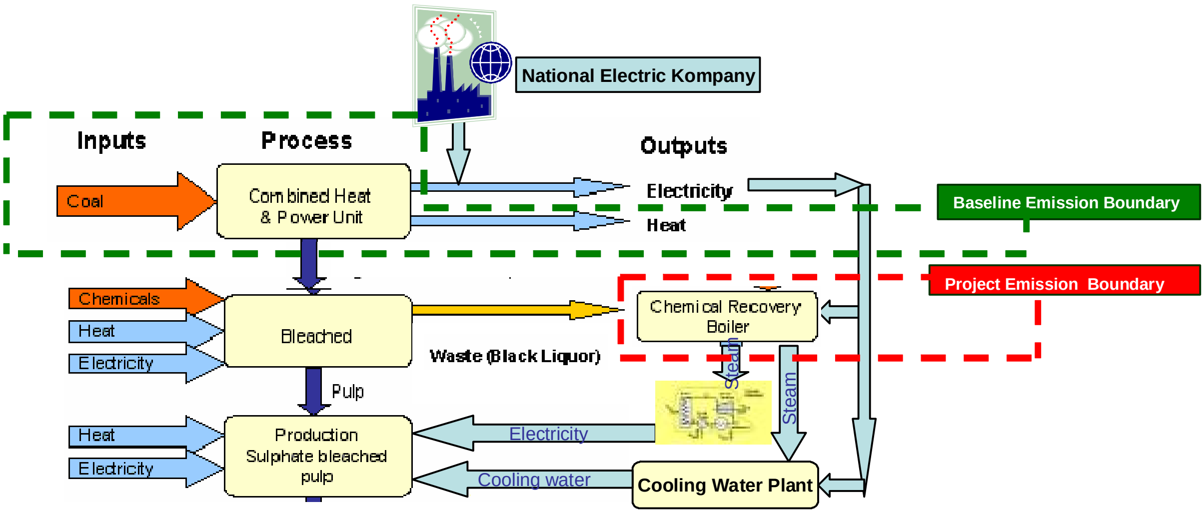
§ It is assumed that there is no steam export to the power plant in the project activity scenario and in the baseline scenario.

§ Steam generated under the project activity displaces steam supplied from the power plant;

Additionality

For the additionality of these projects see paragraph A.4.4

Project boundary



Baseline Scenario:

The SRB was built in 1971 and is of Czech manufacture. It is a single-drum type design for continuous black liquor[15] capacity of 335 tds[16]/day. The boiler is equipped with a direct cyclone evaporator, after which the concentration of black liquor is 60%.

The SRB is designed to produce 50 t/h of steam at 440°C and 41 bars but it currently works at 70% of its full capacity.

The concentration of the black liquor fed into the cyclone evaporator is 54%, and, at the exit, 60% dry substance. With this concentration the black liquor is fed as fuel to SRB. The higher the concentration of black liquor fed to the boiler, the less the heat spent in the furnace chamber of the boiler for heating and evaporating the water content of the black liquor. In addition the flue gas volume is also reduced.

The plan to increasing the production of pulp requires increasing the present capacity of the SRB from 335 to 550 tDS/day of black liquor.

The main items related to the boiler reconstruction are as follows:

- The bottom will be replaced up to the tertiary level including air nozzles, registers, smelt spouts, and necessary support structures;

[15] Black liquor is a recycled by-product formed during the pulping of wood. In this process, lignin is separated from cellulose, with the latter forming the paper fibres. Black liquor is the combination of the lignin residue with water and the chemicals used for the extraction. The primary chemicals are sodium salts

[16] tonnes of dry substance

- Rebuild of the combustion air system including fans, pre-heaters and ducts;
- Installation of new black liquor burners and new start burners;
- Repair/exchange of the super heaters. The cooling system should also be rebuilt
- Additional soot blowers for the new heat exchangers;
- To achieve the limit of admissible emissions, it is planned to build in a new electrostatic precipitator and new scrubber for flue gases;
- New flue gases fan will extract the gases from the boiler;
- New system for green liquor – agitators for the smelt dissolving, scrubber for catching vapours above solvent;
- New feeding pumps for the boiler;
- Main steam pipeline and main steam valve – replacement;
- New management system to monitor and control safety and operations at SRB.

Currently the boiler is equipped with a direct evaporator, after which the black liquor is burned with a dry content of 60%. The new production capacity can be reached operating continuously the two evaporator trains close to their maximum capacity until 2012. Evaporators are in good conditions and no issues related to them are critical to the Complex license conditions, which will be in full compliance with EU directives.

Project Activity:

The planned measure includes the installation of a super concentrator that will increase the liquor dry substance concentration to 70% before the incineration in the SRB, decreasing the heat required for water evaporation by means of installing of a new washing line in order to reach higher concentration before the evaporation plants. Furthermore, economizer will be reconstructed by adding an additional economizer package for absorbing the heat, which can not be used any more by the eliminated cyclone evaporator. According to the above mentioned assumptions, the engineering plan foresees a 78% overall efficiency for the SRB.

Emission reduction

The steam optimization projects reduce consumption of steam in the production processes and reduce steam demand from CHP plant. The emission reduction ER_{coal} during a given year is given by:

$ER_{coal} = BE_{coal} – PE_{coal}$

where:

BE_{coal}: baseline emission during a given year, expressed in tCO_2;

PE_{coal}: project emissions during a given year, expressed in tCO_2.

Formulae used for emission reduction calculation are explained on paragraphs E.1.2.1 and E.1.2.4. Evidence of how energy savings were calculated are explained on Annex 1 "Emission reduction spreadsheet".

Sensitivity Analysis

The main parameters that will affect the energy efficiency performance of the soda recovery boiler, after reconstruction, are the quality of the black liquor supplied after super concentrator and the load factor of the boiler itself.

A variation of the total dry solid content of the black liquor will result in a variation of the overall SRB efficiency. The lower the dry solid content the lower the efficiency. The same applies to the boiler load factor.

The sensitivity analysis was carried out to evaluate the impact on emission reductions generated from the project activity due to a ±2% variation of the boiler efficiency.

As shown in figure B.3, a 2% variation of the boiler efficiency, which is in any case a very high variation, leads to a 21% variation of total emission reductions.

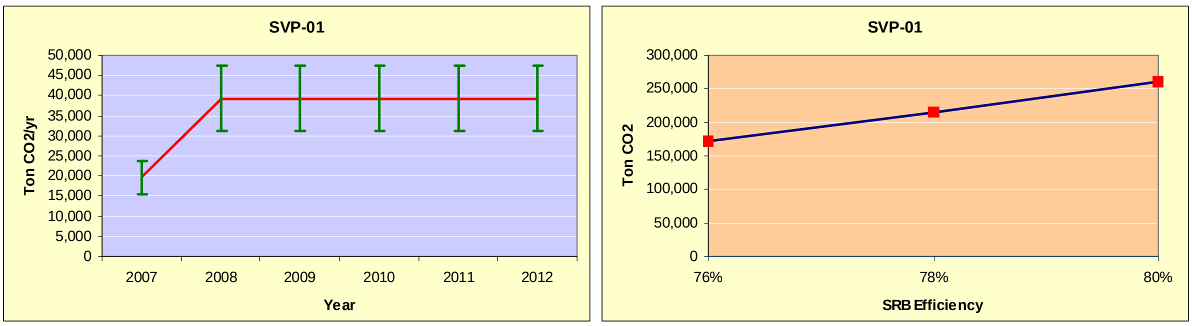


Figure B.3: Sensitivity analysis for measure SVP-01

The following table summarises the variation of total emission reductions as function of the SRB efficiency:

Scenario	Overall SRB Efficiency [%]	Total Emission Reduction over Crediting Period [tCO_2]
Worst Case Scenario	76	171,423
Estimated Project Activity Scenario	78	215,719
Best Case Scenario	80	260,015

Table B.1: Total Emission Reduction over Crediting Period for measure SVP-01

B.3.3.2 Replacement of barometric condensers with plate heat exchangers in evaporating systems for black liquor – SVP-02

Source

This methodology is referred to the methodology exposed in paragraph B.3.3.1

Baseline Scenario

The washing installation is designed for increasing the concentration of the weak black liquor. Up to 13% increase of the dry substance concentration in the black liquor is achieved using vacuum filters. After the washing installation, the increase of the black liquor concentration is carried out in the evaporating installation and in the cyclone evaporator, before feeding it as a fuel to the SRB.

The concentration increasing in the evaporating installation is carried out by heating the black liquor by means of steam in a cascade of evaporators and maintaining vacuum at the end of the installation. To utilize part of the evaporated water heat, a barometric condenser (contact heat exchanger) for heating process water is used. The cooling water mixes with the water steam coming from the installation in the barometric condenser and is discharged in the sewerage. The black liquor concentration after the evaporating installation reaches 54%.

The new production capacity can be reached at a lower price by maintaining the existing design and technologies. Barometric condensers are in good conditions and can be operated until 2012 and no issues related to them are critical to the Complex license conditions, which will be in full compliance with EU directives.

Project Activity:

A new parallel technological line with two new filters will be installed to the washing installation to increase the concentration of the weak black liquor up to 18%. In order to increase the efficiency and capacity of the evaporating installations the two barometric condensers will be replaced with two new surface heat exchangers with indirect heat exchange. As a result of it the concentration of the weak black liquor will increase up to 60% and heat consumption will be decreased at the final step of the installation

Two significant energy saving effects will be achieved: the black liquor concentration will increase from 54% to 60%, and losses from cooling water, which after the barometric condensers is discharged into the sewerage, are avoided.

Thanks to the new indirect heat exchangers, the heat from the steam condensation at the end of the evaporating installation will be used to the maximum. Hence, the volume of heated water for technological needs will increase, avoiding the use of additional steam.

Sensitivity Analysis

The main parameter that will affect the energy efficiency performance of the new heat exchanger in evaporating systems for black liquor, after reconstruction, is the quantity of black liquor supplied after the evaporating installation.

A flow rate variation of the black liquor at 100% TDS will result in a variation of the heat content available to be recovered through the new heat exchangers. The lower the flow rate the lower the heat transfer.

The sensitivity analysis was carried out to evaluate the impact on emission reductions generated from the project activity due to a ±5% variation of the black liquor flow rate.

As shown in figure B.4, a 5% variation of the black liquor flow rate leads to a 5% variation of total emission reductions.

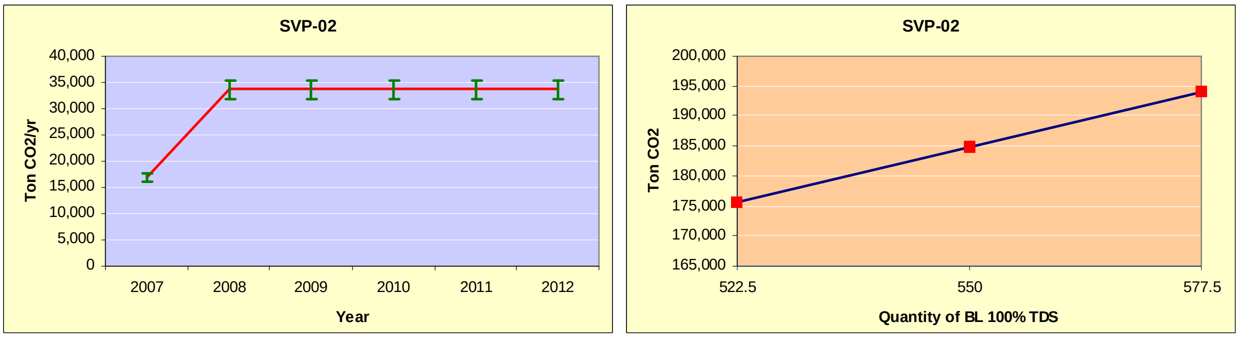


Figure B.4: Sensitivity analysis for measure SVP-02

The following table summarises the variation of total emission reductions as function of the 100% TDS black liquor flow rate:

Scenario	Black Liquor Flow Rate [t/yr]	Total Emission Reduction over Crediting Period [tCO_2]
Worst Case Scenario	522.5	175,487
Estimated Project Activity Scenario	550	184,721
Best Case Scenario	577.5	193,959

Table B.2: Total Emission Reduction over Crediting Period for measure SVP-02

B.3.3.3 Installation of Frequency Control Drives (VFD) on Electric Motors – SVP-03

Source

This baseline methodology refers to the CDM methodology: "AMS II C: Demand-side energy efficiency programmes for specific technologies".

Selected approach from paragraph 48 of the CDM modalities and procedures

The baseline methodology deemed most appropriate for the project activity is:

(a) "Existing actual or historical emissions as applicable".

Option (a) is most suitable because historical data of energy performance in terms of power load profile and power demand of motors are available and, compared to options (b) and (c), it represent the most conservative and accurate option.

Applicability:

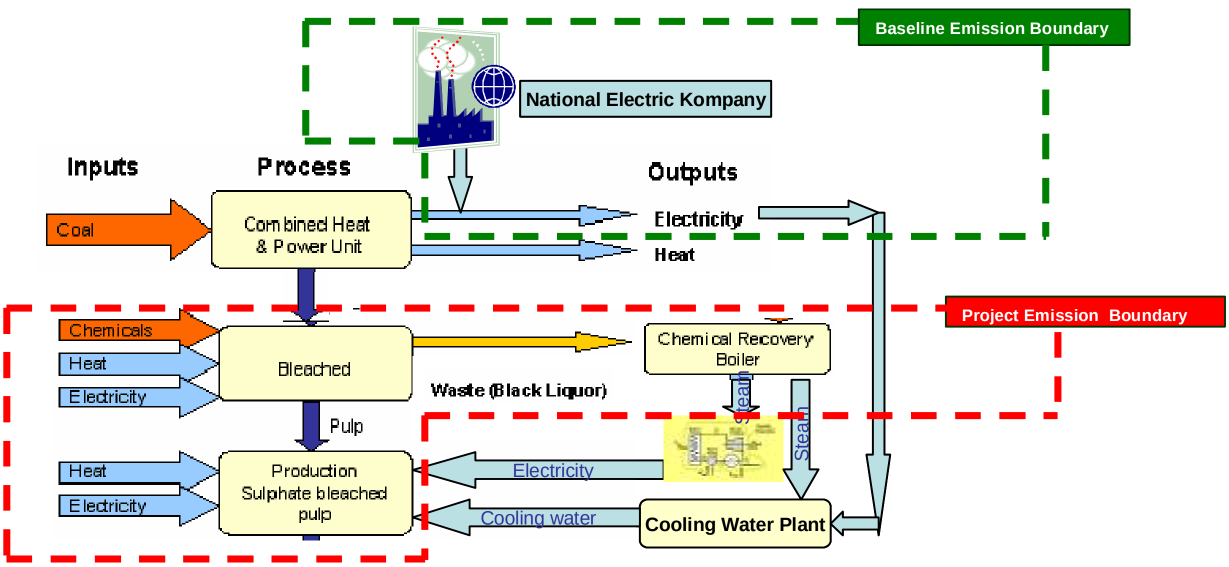
This methodology is applicable to project activities that improve energy efficiency of the process switching from electric motors to VFDs.

The methodology was used under the condition that electricity saved reduces the electricity supplied by National Electricity Grid (NEK).

Additionality

For the additionality of the project refers to paragraph A.4.4

Project boundary



Baseline Scenario

The electric motors mounted in the fibre line at the feed water pumps, draught air fans and air suction fans of the SRB, as well as on the cutting machines are oversized. Besides, they work under variable load demand and their full capacity is not always used.

Due to over sizing, the plan for production increase can be achieved without any needs to change or add additional electric motors. Furthermore they are good maintained and can be operated until 2012.

Project Activity:

The following electric motors will be equipped with VFDs to allow accurate modulation of flow based on the process demand. Typically the drives will reduce the pumping flow by an average of 10%. This leads to a 27% reduction in pumping energy due to the cube law relating flow and pumping power.

1. Fibre Line: MOM315S-2 160 kW Middle Consistency Pump for feeding of the bleaching tower

2. Fibre Line: MO280M-2 132 kW Middle Consistency Pump for feeding of the bleaching tower

3. Fibre Line:MOM315S-4 200 kW bleaching department return water pump

4. Bark Boiler: 5AM280MYY3 132 kW flue gases fan on bark boiler

Emission reduction

The efficiency of the VFDs reduce consumption of electricity in the production processes and reduce electricity demand from the Grid. The emission reduction ER_{VFDs} during a given year is given by:

$ER_{VFDs} = BE_{VFDs} – PE_{VFDs}$

where:

BE_{VFDs}: baseline emission during a given year, expressed in tCO_2;

PE_{VFDs}: project emissions during a given year, expressed in tCO_2.

Formulae used for emission reduction calculation are explained on paragraphs E.1.2.1 and E.1.2.4. Evidence of how energy savings were calculated are explained on Annex 1 "Emission reduction spreadsheet".

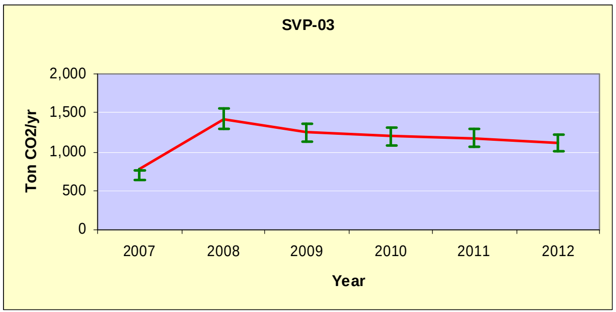
Sensitivity Analysis

The main parameter that will affect the energy efficiency performance after installation of variable speed drives on selected motors is the flow rate of the fluid moved through pumps associated to those motors.

A flow rate variation of the fluid pumped will result in a variation of the power demand following a cube low. The lower the flow rate the lower the power demand.

The sensitivity analysis was carried out to evaluate the impact on emission reductions generated from the project activity due to a ±10% variation of the pumps' flow rate.

As shown in figure B.5, a 10% incremental variation of the pumps' flow rate (variation from a design flow rate reduction estimated at 8.7% and calculated using software supplied by Schneider Electrics) leads to a 9.5% incremental variation of total emission reductions.



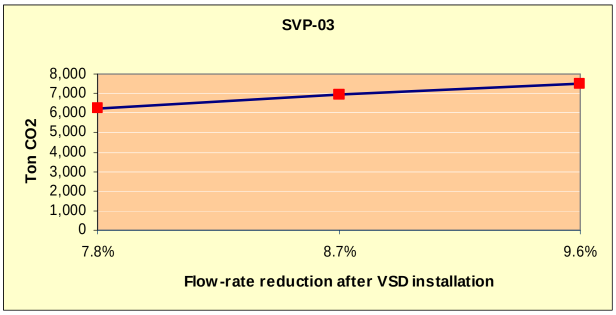


Figure B.5: Sensitivity analysis for measure SVP-03

The following table summarises the variation of total emission reductions as function of the pumping flow rate reduction:

Scenario	Avg. Pumps Flow Rate Reduction [%]	Avg. Power Demand Reduction [%]	Total Emission Reduction over Crediting Period [tCO_2]
Worst Case Scenario	7.8	21.6	6,206
Estimated Project Activity Scenario	8.7	23.9	6,938
Best Case Scenario	9.6	26.1	7,499

Table B.3: Total Emission Reduction over Crediting Period for measure SVP-03

B.3.3.4 Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity – SVP-04

Source

No approved baseline methodologies fully applicable to the project activity are available, therefore this approach for baseline methodology has been developed by the project proponent. It takes anyway reference to the Approved Baseline Methodology AM0024 "Baseline Methodology for GHGs reduction through waste heat recovery and utilization for power generation at cement plants", where applicable to the project activity.

Selected approach from paragraph 48 of the CDM modalities and procedures

The baseline methodology deemed most appropriate for the project activity is:

(b) "Emission from a technology that represent an economically and attractive course of action, taking into account barriers to investment".

Option (b) is most suitable because historical data of energy performance are not available and because, being based on actual performance of a technology similar to that it will be installed, it is deemed more conservative and accurate than option (c).

Applicability

This baseline methodology is applicable to the project activity "Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity".

The methodology was used under the following conditions:

§ The electricity produced is used within the pulp mill where the proposed project activity is located, remaining electricity need are supplied by the National Electricity Grid (NEK); it is assumed that there is no electricity export to the power plant in the baseline scenario and in the project activity scenario.

§ All increases in electricity consumption as a result of the project activity were considered.

§ Electricity generated under the project activity displaces electricity supplied by the grid.

§ In the baseline scenario the steam pressure is reduced through pressure regulation stations, which are essentially throttling valves. When steam pressure is reduced through a regulator the excess energy that is stored in the high pressure steam is converted into superheat. This superheat is essentially useless energy, much of which is lost through piping heat losses because of its high temperature. In the baseline scenario the recycling of waste steam for producing energy is not possible.

Explanatory note to applicability criteria above

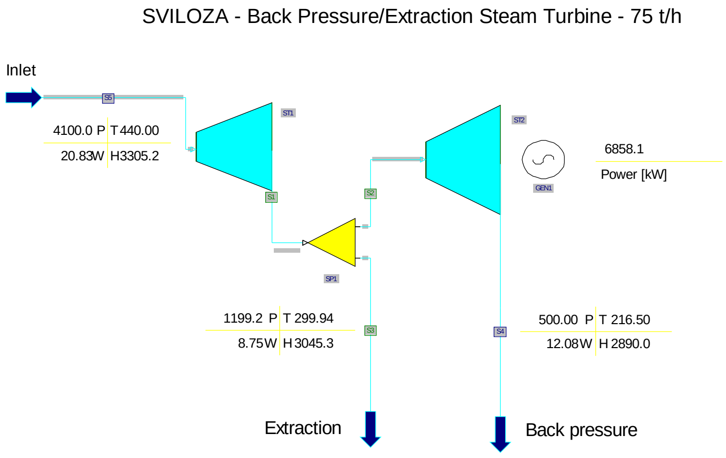


Figure B.6: Proposed scheme for installation of back-pressure steam turbine (SVP-04)

Figure above shows the proposed scheme for installation of back pressure steam turbine inside the production process.

The project activity instead of putting the waste steam inside the throttling valves, produces electricity connecting the waste steam to the back pressure steam turbine. After this project activity the electricity generated can be used in the process and the low pressure steam can be used more effectively in heat exchangers and humidifiers.

After measurement of the specific steam turbine electricity production will be possible calculate the real impact of any change in emission by the NEK.

Project boundary

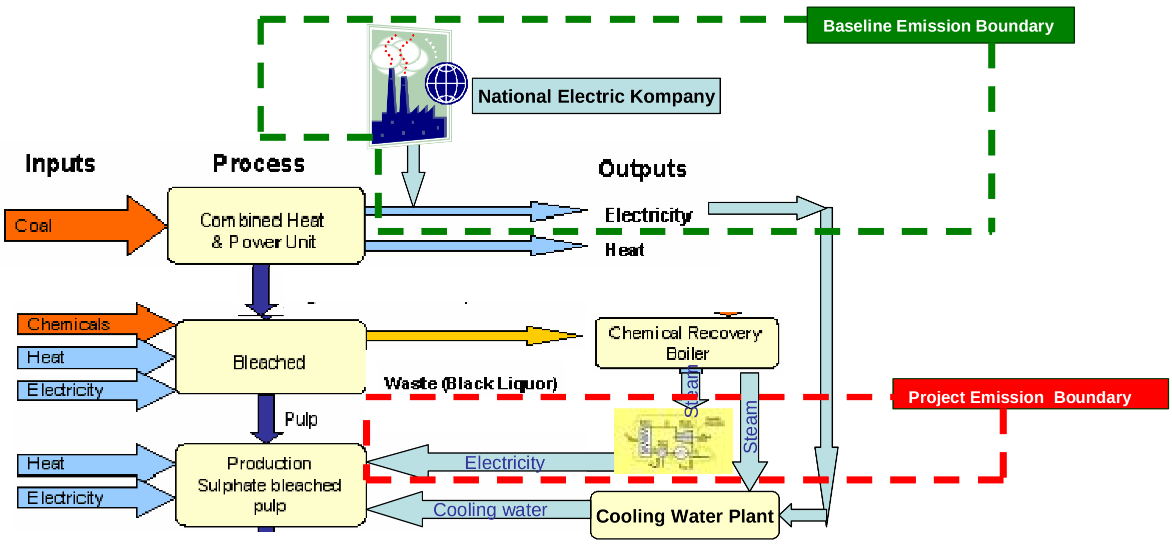


Table below illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

	Source	Gas		Justification/explanation
Baseline	NEK electricity generation	CO_2	included	Main emission source
Project activity	NEK electricity generation	CO_2	included	Main emission source
	On site fossil fuel consumption	CO_2	Excluded	There are no emission sources related to this project activity

Table B.4: Overview on emission sources included in or excluded from the project boundary

Baseline Scenario

SRB produces overheated steam under pressure 41 bars and a temperature 440°C, after which the steam is reduced to 12 bars and 220°C. Additional reduction from 12 to 5 bars follow to meet other technological needs of the plant. Data monitored show that, 42% of the final users, require steam with working pressure of 12 bars, and the remaining 58% use steam with pressure at 5 bars.

The key issue which must be resolved for the installation of the back pressure steam turbine to proceed, is the availability of funds, which is directly linked to the approval of the Joint Implementation project. Without approval of the JI project the steam turbine will not be installed.

The doubling of the production will not require in any case to implement this energy efficiency measure.

Project Activity:

This represents a potential opportunity to generate some additional electricity on site. Back pressure steam turbines have the ability to generate useful electricity while reducing the steam pressure. In this case the resulting steam is near saturation, and at a much lower temperature. The excess energy will be used to generate electricity, and the low pressure steam can be used more effectively in heat exchangers and humidifiers[17].

A cogeneration plant for a combined production of electricity and steam for technological needs will be installed. The technology selected is a back pressure steam turbine coupled with electricity generator with a capacity of approximately 6.2 MW_{el}.

Emission reduction

[17] The steam is more effective for heating because less heat exchanger surface area is required to remove heat from condensing steam then from superheated steam. The steam is more effective for humidification because it heats the air less, due to less superheat, thus less pre-cooling is required.

The project activity reduces CO_2 emissions from electricity consumption by using waste steam to produce electricity and reduce electricity demand from grid. The emission reduction ER_T during a given year[18] is given by:

$ER_T = BE_T - PE_T$

where:

BE_T: baseline emission during a given year, expressed in tCO_2;

PE_T: project emissions during a given year, expressed in tCO_2.

Formulae used for emission reduction calculation are explained on paragraphs E.1.2.1 and E.1.2.4. Evidence of how energy savings were calculated, are explained on Annex 1 "Emission reduction spreadsheet".

Sensitivity Analysis

The main parameter that will affect the energy efficiency performance of the new steam turbine are efficiency and load factor of the turbine, which directly reflect on the electricity produced.

A variation of the efficiency and load factor of the turbine will result in a proportional variation of the electricity produced.

The sensitivity analysis was carried out to evaluate the impact on emission reductions generated from the project activity due to a ±10% variation of the electricity produced from the steam turbine.

As shown in figure B.7, a 10% variation of the electricity production leads to a 10% variation of total emission reductions.

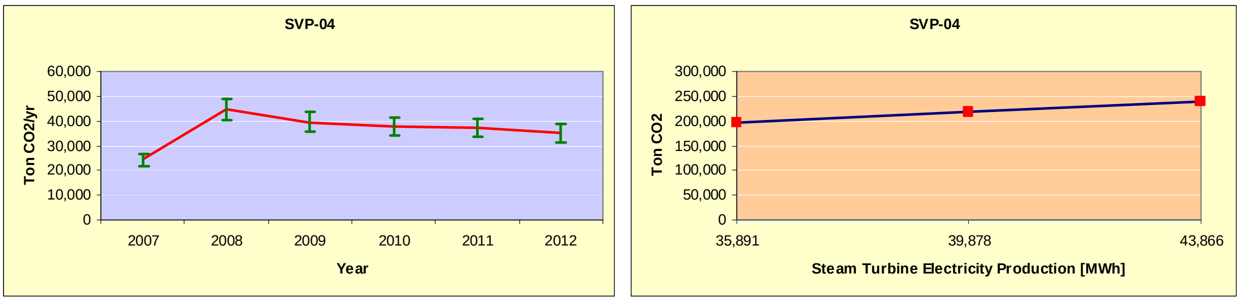


Figure B.7: Sensitivity analysis for measure SVP-04

[18]This parameter will be evaluated annually for each year of the crediting period.

The following table summarises the variation of total emission reductions as function of the electricity production:

Scenario	Electricity Production [MWh/yr]	Total Emission Reduction over Crediting Period [tCO_2]
Worst Case Scenario	35,891	196,062
Estimated Project Activity Scenario	39,879	217,847
Best Case Scenario	43,866	239,632

Table B.5: Total Emission Reduction over Crediting Period for measure SVP-04

B.3.3.5 Blow down heat recovery system for SRB – SVP-05

Source

This methodology is referred to the methodology exposed in paragraph B.3.3.1

Baseline Scenario

Increased saline content of water in the boiler drum results from water evaporation in SRB. This is an unwanted phenomenon, particularly when the steam is fed to a steam turbine. Precipitation of salts carried by the steam along the heating surfaces of the preheated waters leads to a reduction of their efficiency, overheating of walls, while in the case of turbines salinity on the blades may lead to misbalance of the turbine rotor and failure. In addition, the power of the turbine changes in some degree. One of the most efficient ways to avoid this unwanted phenomenon is a continuous blow-down of the boiler. This is related to loss of water and particularly to the loss of considerable quantity of heat. This represents the present situation at Svilocell.

Project Activity:

This energy efficiency measure includes the introduction of an automatic system for monitoring the quantity of salts in the SRB boiler drum and to perform an automatic blow-down.

Hot, high pressure continuous blow-down water drained from the boiler, contains valuable heat energy. The automatic blow-down process helps to control boiler water quality and operating efficiency by removing suspended and dissolved solids from the water in the boiler drum.

The blow-down condensate can be used to preheat the boiler feed water or to heat water for technological uses using a low pressure liquid heat exchanger. Both opportunities actually exist and the final choice is under consideration.

Sensitivity Analysis

The main parameter that will affect the energy efficiency performance of the new heat recovery system is the blow down rate. The lower the blow down rate the lower the heat recovery.

The sensitivity analysis was carried out to evaluate the impact on emission reductions generated from the project activity due to a blow down rate variation from 2.5% to 3.5% compared to current value of 3%.

As shown in figure B.8, the variation of the blow down rate from 2.5% to 3.5% leads to a 17% variation of total emission reductions. It's worth noting that variation of 0.5% are very high for this system and therefore very unlikely to happen.

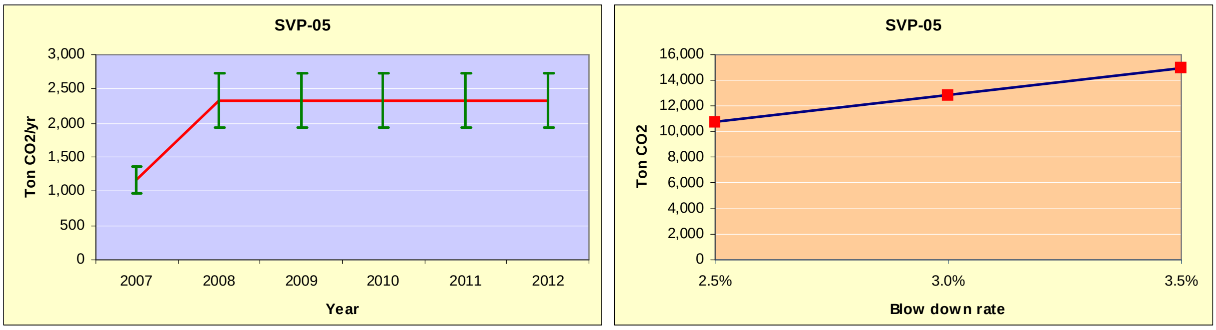


Figure B.8: Sensitivity analysis for measure SVP-05

The following table summarises the variation of total emission reductions as function of the blow down rate:

Scenario	Blow Down Rate [%]	Total Emission Reduction over Crediting Period [tCO_2]
Worst Case Scenario	2.5	10,688
Estimated Project Activity Scenario	3.0	12,825
Best Case Scenario	3.5	14,964

Table B.6: Total Emission Reduction over Crediting Period for measure SVP-05

B.3.3.6 Shift from pulp blocks to pulp sheets line in the drying process – SVP-06

Source

No approved baseline methodologies fully applicable to the project activity are available; therefore this approach for baseline methodology has been developed by the project proponent.

Selected approach from paragraph 48 of the CDM modalities and procedures

The baseline methodology deemed most appropriate for the project activity is:

(a) "Existing actual or historical emissions as applicable".

Option (a) is most suitable because historical data of energy performance in terms of power load profile and power demand of motors are available and, compared to options (b) and (c), it represent the most conservative and accurate option.

Applicability:

This methodology is applicable to project activities that improve energy efficiency and energy saving of the process ceasing the production of pulp blocks and increasing the production of pulp sheets.

The methodology was used under the following conditions:

§ Electricity saved under the project activity reduces electricity demand from the grid;

§ Switching from block line to sheet line the production is supposed to be the same;

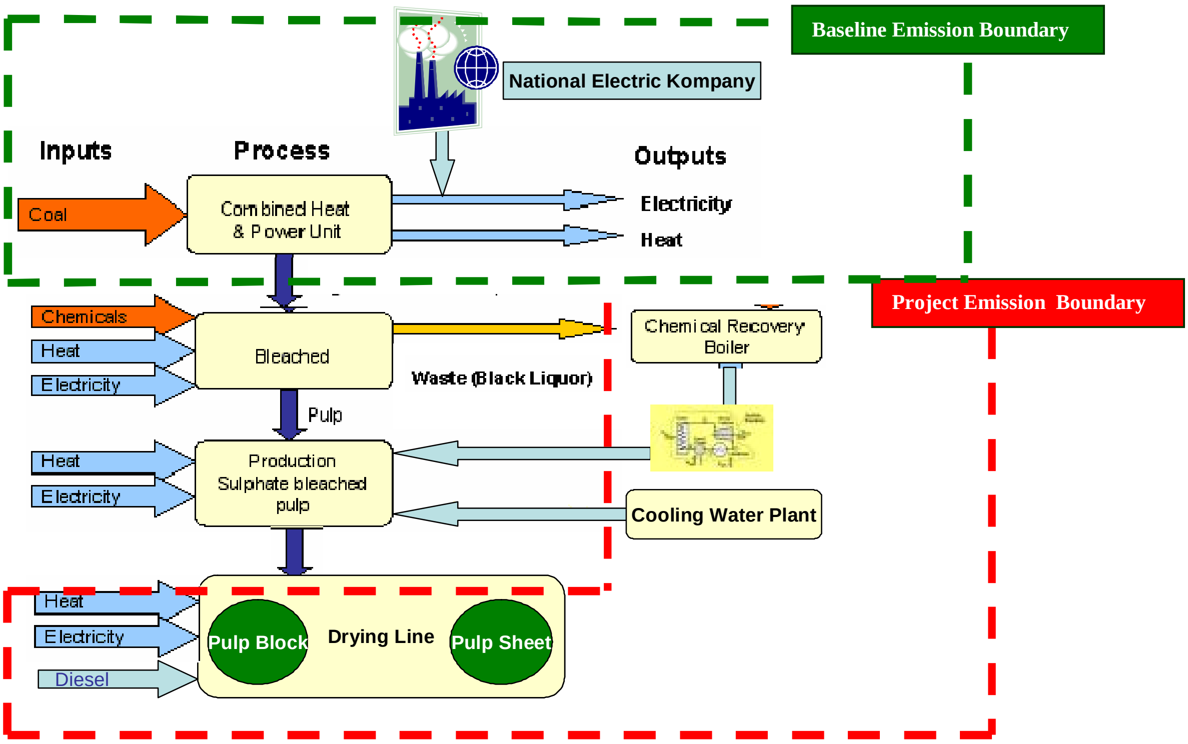
§ Thermal energy saved under the project activity reduces steam demand from the power plant;

§ Fuel saved under the project activity is not replaces by any other fuel.

Additionality

For the additionality of the project refers to paragraph A.4.4

Project boundary



Baseline Scenario

The pulp mill has two main technological lines for production of pulp: sheet pulp and block pulp. The efficiency of the pulp blocks line, in terms of energy consumption, is lower than pulp sheets due to higher unit consumption of electricity and steam and additional consumption of diesel oil as a fuel for the drying furnace.

At present 58% of the drying process is carried out through the pulp blocks line, while the remaining 42% is made using the pulp sheets line.

The total capacity of the two lines is not sufficient to cope with future production increase, it is therefore necessary to expand the lines. Both pulp blocks and pulp sheets lines are perfectly efficient and the most logical solution in terms of design optimisation and cost containment would be to upgrade in parallel the two lines.

Project Activity:

Ceasing the production of pulp blocks and increasing the production of pulp sheets will result in energy savings.

The main benefit for energy saving will be determined by reducing 45% electricity consumptions, 12% steam consumptions and eliminating diesel oil as fuel for the drying furnace for pulp blocks line.

Emission reduction

The energy saving project reduce consumption of electricity, steam and diesel oil in the drying line. The emission reduction ER during a given year is given by:

ER= BE – PE

where:

BE: baseline emission during a given year, expressed in tCO_2;

PE: project emissions during a given year, expressed in tCO_2.

Formulae used for emission reduction calculation are explained on paragraphs E.1.2.1 and E.1.2.4. Evidence of how energy savings were calculated are explained on Annex 1 "Emission reduction spreadsheet".

Sensitivity Analysis

The main parameter that will affect the energy efficiency performance of this measure is the actual pulp production.

The sensitivity analysis was carried out to evaluate the impact on emission reductions generated from the project activity due to a variation of annual pulp production from 100,000 to 120,000 ton, compared to the 110,000 ton that is considered the most likely baseline scenario.

As shown in figure B.9, this variation in pulp production leads to a 9% variation of total emission reductions.

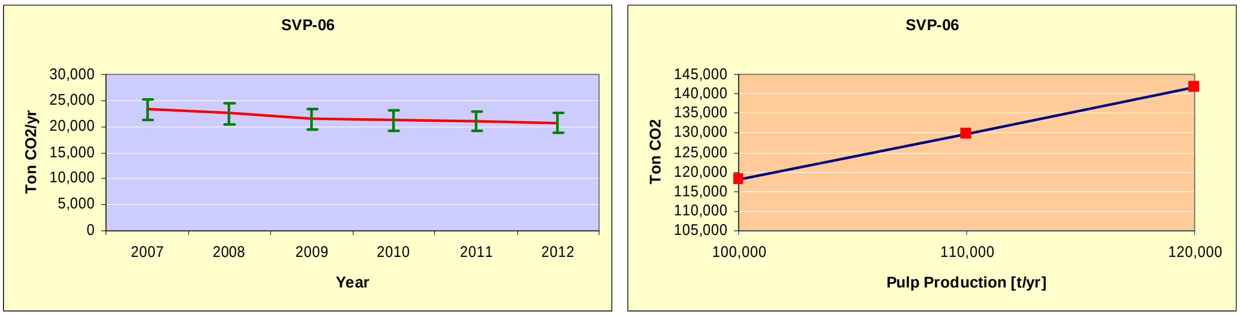


Figure B.9: Sensitivity analysis for measure SVP-06

The following table summarises the variation of total emission reductions as function of the annual pulp production:

Scenario	Annual Pulp Production [t/yr]	Total Emission Reduction over Crediting Period [tCO_2]

Scenario	Annual Pulp Production [t/yr]	Total Emission Reduction over Crediting Period [tCO_2]
Worst Case Scenario	100.000	118,121
Estimated Project Activity Scenario	110,000	129,933
Best Case Scenario	120,000	141,745

Table B.7: Total Emission Reduction over Crediting Period for measure SVP-06

B.3.3.8 Sensitivity analysis for total project activity

Based on the sensitivity analysis made for each single project activity, the sensitivity analysis for total project activity has been made summing results obtained for the worst case and the best case scenarios. As shown in figure B.10 the uncertainty of total emission reductions is approximately ±11% and varies over the crediting period from 692,693 to 875,662 ton of CO_2.

Figure B.10: Sensitivity analysis for total project activity

The following table summarises the main parameters considered for the sensitivity analysis and the uncertainty on total emission reductions over the crediting period:

Parameters	UoM	Worst Case Scenario	Estimated Project Activity Scenario	Best Case Scenario
SRB Efficiency	%	76	78	80
Quantity of BL 100% TDS	t/yr	522.5	550	577.5
Flow-rate reduction after VSD installation	%	7.8	8.7	9.6
Steam Turbine electricity production	MWh/yr	35,891	39,878	43,866
Blow down rate	%	2.5	3.0	3.5
Pulp production	t/yr	100,000	110,000	120,000
Total Emission Reductions	tCO_2	677,988	767,983	857,814

Table B.8: Total Emission Reduction over Crediting Period for whole project activities

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

According to definition set forth by the Netherlands "Operational Guidelines for Joint Implementation Projects", source of GHG emissions can be on-site and off-site and can be classified as direct and indirect emissions.

Direct emissions are those "emissions under direct influence and control of the project" while the indirect are "emissions that occur outside of the project boundary".

The following table links each of the energy efficiency measure to the component of the current system influenced by the project, the location and scope of impacted GHG emissions, and the reasons why emissions where included or excluded by the project.

# EEM	Component	Location of GHG emission	Scope of emission	Baseline boundary / Project boundary
SVP-01	On site SRB	CO_2 emissions from nearby power plant (CHP) due to steam consumption	Direct, off-site	Included, outside the project boundary
		CO_2 emissions from heavy fuel oil during start-up operation	Direct, on-site	Included, outside the project boundary
SVP-02	On site SRB	CO_2 emissions from nearby power plant (CHP) due to steam consumption	Direct, off-site	Included, outside the project boundary
		CO_2 emissions from heavy fuel oil during start-up operation	Direct, on-site	Included, outside the project boundary
SVP-03	On site SRB & cutting machines	CO_2 emissions from national electrical grid due to electricity consumption	Direct, off-site	Included, outside the project boundary
SVP-04	On site SRB	CO_2 emissions from national electrical grid due to electricity consumption	Direct, off-site	Included, outside the project boundary
SVP-05	On site SRB	CO_2 emissions from nearby power plant (CHP) due to steam consumption	Direct, off-site	Included, outside the project boundary
SVP-06	On site drying line	CO_2 emissions from nearby power plant (CHP) due to steam consumption	Direct, off-site	Included, outside the project boundary
		CO_2 emissions from national electrical grid due to electricity consumption	Direct, off-site	Included, outside the project boundary
		CO_2 emissions from diesel fuel consumption	Direct, on-site	Included, within the project boundary

Table B.9: Direct on-site emissions

The sources of direct on-site emissions connected to project activity are the combustion of diesel and heavy fuel oil, which are included in the project boundary. The emissions related to the use of heavy fuel oil are included in the project boundary although this fuel is used only for start-up operations of the SRB and for emergency situations, and it accounts for less than 1% of total fuel consumption[19].

CO_2 emissions associated to heavy fuel oil consumption are:

[19] As a matter of fact, heavy fuel oil consumptions in last three years never exceeded 0.3% of annual fuel consumption of the SRB

210.6 ton/yr x 3.11 tCO_2/tfuel=655 tCO_2/yr

It represents 0.3% of total CO_2 emissions.

With regards to the baseline methodology relative to all measures affecting the SRB (see section B.3.3.1), the installation of a super concentrator and of plate heat exchangers (measures SVP-01, SVP-02 and SVP-03) do not affect start-up operations of the SRB.

Today start-up operations of the SRB are mainly due to down time caused by steam leakages in the system; the modernization of the SRB will reduce leakages and therefore start and stop cycles of the boiler

The impact of the project activity on SRB start-up operations, if any would be positive, with consequent reduction of heavy fuel consumption and GHG emissions.

Fore the reason above, exclusion of calculations of emissions due to heavy fuel oil consumptions for start-up operations in the baseline and project activity represents a conservative approach

Furthermore, a 20-30% reduction of the heavy fuel oil consumption, it would impact for less than 1‰ on GHG emissions. In consideration of that emissions due to heavy fuel oil consumption for start-up operations are not included in baseline and project emissions calculation.

However, heavy fuel oil consumption is included in the Monitoring Plan and eventual drifts from expected trend could be easily monitored

Off-site emission sources are related to electricity supply from Bulgarian Electrical Power System and to heat supplied from the nearby CHP plant; they are included in the baseline emission boundary, but not in the project emission boundary.

Indirect emission sources from production, transport and distribution of primary fuels and emissions during the construction of the project are considered to be non-significant and are outside control and measuring capacity of the project developer.

The following table summarises the emissions attributable to the project activity subdivided by scope.

Emission source	Locality	GHG	Significance
Diesel combustion	Drying furnace for block pulp	CO_2	high
Heavy fuel oil consumption	SRB for start-up operation	CO_2	Non-significant, less 1% SRB fuel consumption

Heavy fuel oil consumption	Emergency cases	CO_2	Non-significant, less 1% SRB fuel consumption

Table B.10: Direct on-site emissions

Emission source	Locality	GHG	Significance
Electricity production Bulgaria	CHP	CO_2	high
Heat production Bulgaria	CHP	CO_2	high
Emission during construction of project	Transport	CO_2	insignificant

Table B.11: Direct off-site emissions

Emission source	Locality	GHG	Significance
Transport and distribution of Diesel	CHP	CO_2	insignificant

Table B.12: Indirect emissions

Svilocell purchases the electricity from a coal fired combined heat (280 MW heat) and power (120 MW electricity) plant (CHP), which was divested from the company in 2003.

The heat to the production process is supplied from the CHP unit, from the soda recovery boiler (SRB), which utilises the waste black liquor[20] and from a 14 MW biomass boiler, which utilises the bark, chips and sawdust from the debarking process.

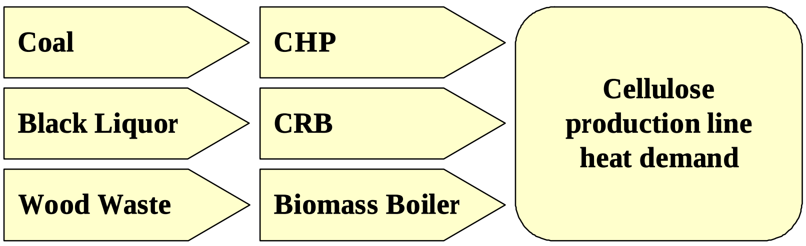


Figure B.11: Flow Chart of "cellulose heat production line heat demand"

The following chart illustrates the steam balance diagram at Svilocell pulp mill.

[20] Black liquor is a recycled byproduct formed during the pulping of wood. In this process, lignin is separated from cellulose, with the latter forming the paper fibres. Black liquor is the combination of the lignin residue with water and the chemicals used for the extraction. The primary chemicals are sodium salts.

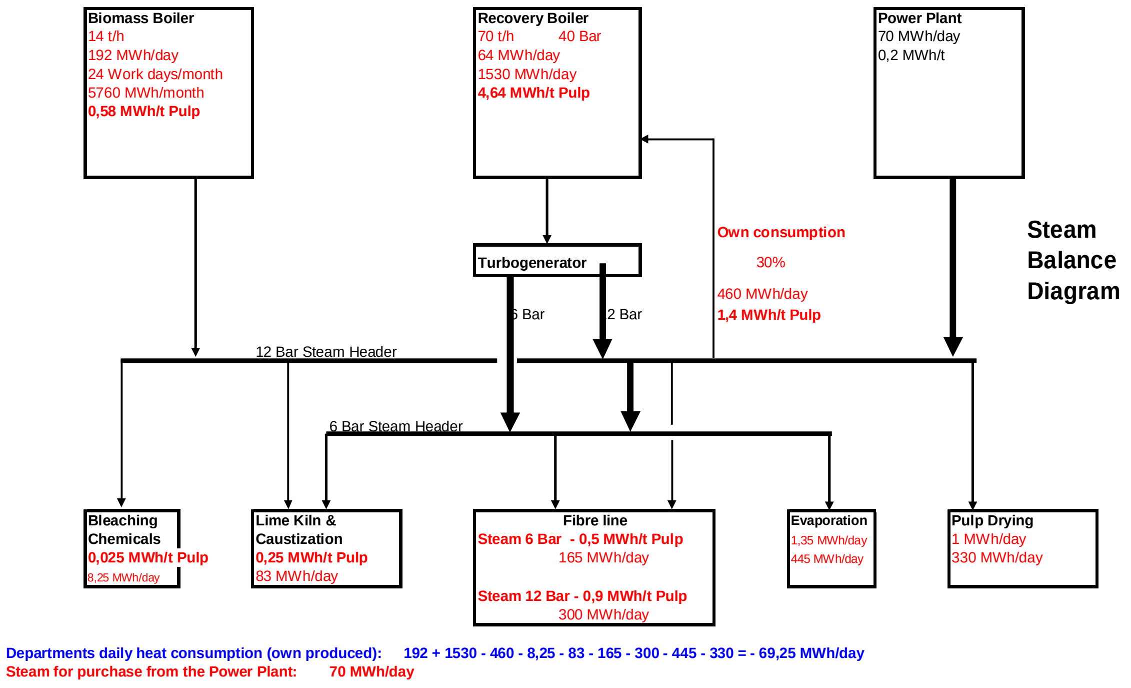


Figure B.12: Steam balance diagram at Svilocell pulp mill

The project boundary is illustrated in the following flow-chart and encompasses all relevant emission effects that can either be controlled or influenced by the project and that are significant and reasonably attributable to the project.

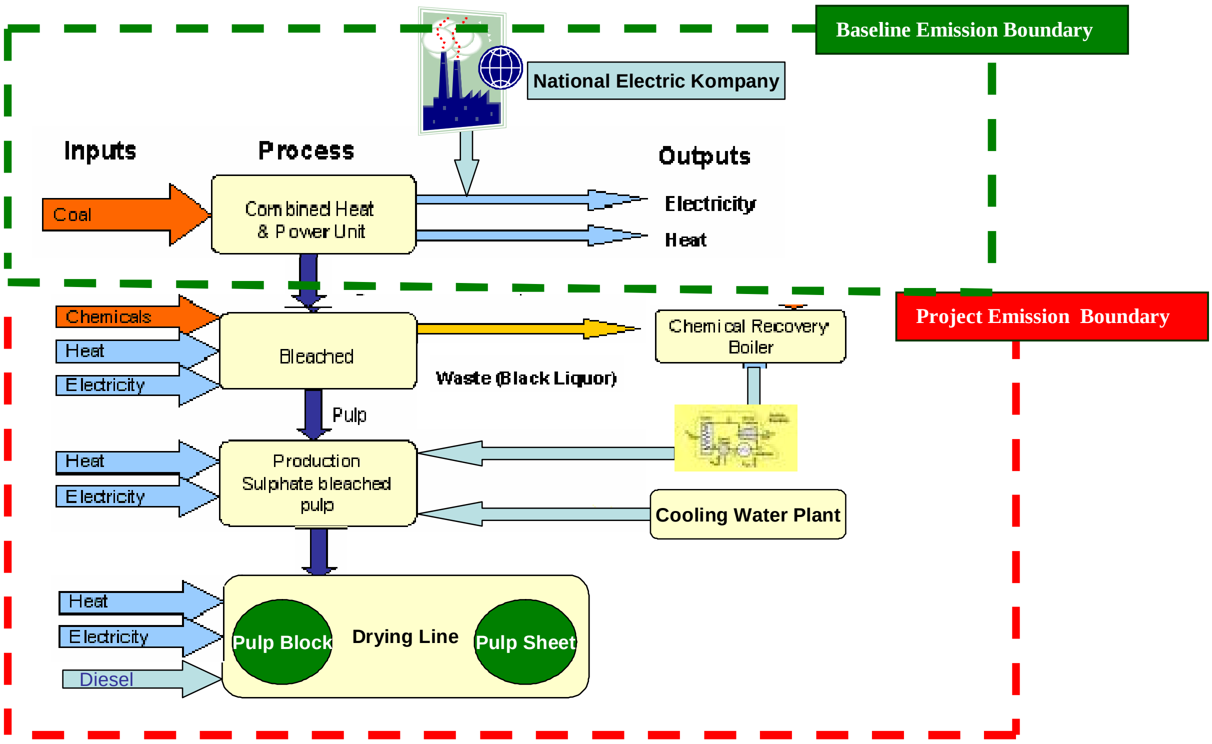


Figure B.13: Operational boundaries at Svilocell pulp mill

The project emission boundary includes processes that are directly impacted by the energy efficiency measures.

The project directly influences the on-site emission by reducing the use of diesel fuel, directly influence the off-site emission because it leads to a decrease of emissions from the CHP reducing the use of heat, and leads to a decrease of emissions from the Bulgarian Electrical Power System. Since the biomass demand at the bark boiler will not be influenced by the proposed JI project, and it is also subject of a different JI project the wood delivery system is not included within the project boundary.

Thus the project boundary comprises the Svilocell facility while baseline boundary comprises the CHP plant and the Bulgarian EPS.

Within the boundaries there are no processes that are responsible for direct emissions due to generation of GHGs from chemical reactions.

B.5. Details of the baseline information and its development:

MWH S.p.A.

Centro Direzionale Milano 2

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20090 Milano – Italy
Mr. Eugenio Ferro
Tel. +39 02 21084 375
Fax: +39 02 26924275

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

C.1. Duration of the project activity:

The project seeks Assigned Amount Units (AAUs) for 2007 and Emission Reduction Units (ERUs) under Art.6 of the Kyoto Protocol for a 5-year period from 2008 to 2012.

C.2. Starting date of the project activity:

The project activity will start in June 2006 with the commissioning of the first energy efficiency measure which is envisaged to be the shift from block pulp to sheet pulp. The schedule of the activities is reported below:

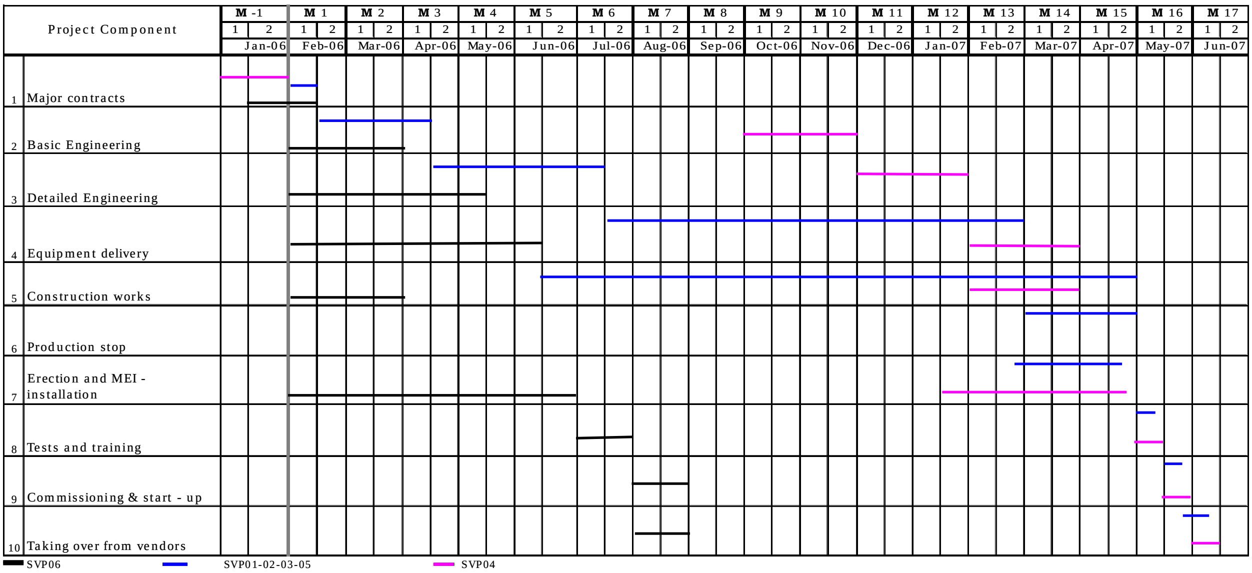

Figure C.1: Schedule for project implementation

C.3. Expected operational lifetime of the project activity:

The operational lifetime of the project activity is estimated in 20 years

C.4. Length of the crediting period:

The length of the crediting period is six years (from 2007 to 2012 inclusive) and will start from 1st January 2007.

SECTION D. Application of a monitoring methodology and plan:

D.1. Name and reference of monitoring methodology applied to the project activity:

The project references, where applicable, to the approved monitoring methodology AMS-II.D. "Energy efficiency and fuel switching measures for industrial facilities".

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

This monitoring methodology covers project activities aimed at energy efficiency. The applicability criteria are the same as for the Baseline Methodology; they are outlined in the Chapter B.1.1 and are therefore not repeated here.

D.3. Data to be monitored:

This JI project Monitoring Plan is a working document that identifies the key project performance indicators and set out the procedures for tracking, monitoring and calculating the emission reductions during the Crediting period (2007-2012).

In order to do that a workbook was implemented. This JI workbook takes the monitored data as input and automatically calculates the GHG emission reductions for each crediting year. The workbook consists in eight worksheets each subdivided in a baseline part and a project part that can be updated and adjusted to meet operational requirements.

A brief explanation of every part of the workbook is given in the following paragraphs.

D.3.1 General parameters

The following general parameters used in all worksheets are to be monitored:

Emission factors from:

- Steam purchased from power plant;
- Electricity purchased from NEK;
- Heavy fuel oil n°6 (mazut);
- Diesel.

Fuel heating values

- Coal;
- Heavy fuel oil;
- Diesel.

Efficiency coefficients

- Power plant thermal efficiency;
- Electricity transmission losses (ETL).

With regard to data related to CHP, the CHP operator will provide and confirm data for delivered steam, used fuel, fuel demand and emission factor of steam, on annual basis.

D.3.2 Replacement of cyclone evaporator with a new super concentrator for black liquor in Soda Recovery Boiler (SRB) – SVP-01

In order to monitor emission reductions associated with the replacement of cyclone evaporator with a new super concentrator for black liquor in SRB these input data are required:

Baseline calculation

- Black liquor flow rate;
- Average calorific value of black liquor;
- Annual working hours for SRB;
- Outlet steam temperature;
- Outlet steam pressure;
- Outlet steam enthalpy;
- Inlet water enthalpy;
- Black liquor inlet concentration of cyclone evaporator;
- Black liquor inlet concentration before concentrator of Recovery boiler.

Project calculation

- SRB efficiency ;
- Black liquor flow rate (Baseline value)
- Average calorific value of black liquor;
- Annual working hours for SRB (Baseline value);
- Outlet steam enthalpy;

- Outlet steam temperature (Baseline value);
- Outlet steam pressure (Baseline value);
- Inlet water enthalpy;
- Black liquor inlet concentration of super concentrator (as Baseline value);
- Black liquor inlet concentration of Recovery boiler;
- Steam purchased from CHP.

D.3.3 Replacement of barometric condensers with plate heat exchangers in evaporating systems for black liquor – SVP-02

In order to monitor emission reductions associated with the replacement of barometric condensers with plate heat exchangers in evaporating systems for black liquor these input data are required:

Baseline calculation

- Quantity of black liquor-Evaporation plant inlet;
- Annual working hours;
- Steam temperature;
- Steam pressure;
- Steam enthalpy
- Condensate enthalpy at T= 70°C, P= 0.78 bar;

Project calculation

- Quantity of black liquor (Baseline value);
- Annual working hours (Baseline value);
- Steam temperature (Baseline value);
- Steam pressure (Baseline value);
- Steam enthalpy (Baseline value);
- Condensate enthalpy at T= 70°C, P= 0.78 bar (Baseline value);
- Black liquor concentration after washing;
- Black liquor concentration before super concentrator.

D.3.4 Installation of Frequency Control Drives (VFD) on Electric Motors – SVP-03

The energy efficiency measure "installation of Frequency Control Divers (VFD) on Electric motors" foresees the installation of variable speed drives (or VFD) on selected existing motors.

In order to monitoring baseline and project emissions data, counters of operating hours and watt-meters are to be installed on each motor. Further to that it is necessary to retrieve the power curve relating the motor efficiency to the load factor for calculation of baseline emissions.

Figure D.1 illustrates typical relationship between motors' efficiency and power load respectively for a traditional motor and a VFD driven motor. The first curve will be used to calculate the baseline emission in function of the power load, calculated as ratio between the average annual power absorbed and the nameplate power of selected motor.

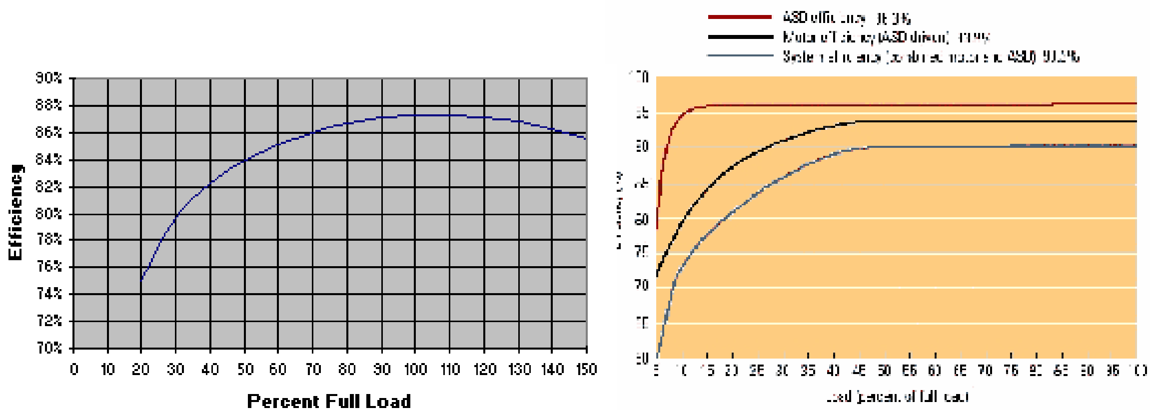

Figure D.1: Typical relationship between motors' efficiency and power load respectively for a traditional motor and a VFD driven motor

Monitoring plan includes measurement of the following input data:

Baseline calculation

§ Real power absorbed;

§ Operating hours;

§ Motor efficiency.

Project calculation

§ Real power absorbed;

§ Operating hours;

Obviously the new system will be equipped with a Programmable Logic Control (PLC) where VFD motors' data will be monitored and transmitted to a monitoring and control system for data elaboration and calculation of average annual power demand and motors' operating hours.

D.3.5 Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity – SVP-04

In order to monitor emission reductions associated with the "Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity" these input data are required:

Baseline calculation

§ Electricity purchased from the grid.

Project calculation

§ Electricity purchased from the grid;

§ Electricity generated from steam turbine.

Being this a totally new project, it will be designed to host an advanced monitoring and control system that will measure in real time all parameters required by the monitoring plan, in particular it will be installed instrumentation for measuring of net electricity generation from steam turbine.

D.3.6 Blow down heat recovery system for SRB – SVP-05

In order to monitor emission reductions associated with the "Installation of Blow down heat recovery system for SRB" these input data are required:

Baseline calculation

§ Annual steam production;

§ Annual working hours for SRB.

Project calculation

§ Annual steam production (baseline value);

§ Annual working hours for SRB (baseline value);

§ Average blow-down rate;

§ Temperature water inlet heat exchanger;

§ Temperature water outlet heat exchanger.

The new heat exchanger will be provided with adequate thermometers and flow meters to measure the heat recovered.

The blow-down rate is expressed as a fraction of the boiler feed-water flow as described by the following formula:

$$AR_{BD} = \frac{Quantity\,\mathbf{K}of\,\mathbf{K}\,blowdown\,\mathbf{K}\,water}{Quantity\,\mathbf{K}\,of\,\mathbf{K}\,feedwater}$$

Flow meter to measure the quantity of blow-down water and feed-water will be installed.

D.3.7 Shift from block pulp to sheet pulp line in the drying process – SVP-06

In order to monitor emission reductions associated with the “shift from pulp blocks to pulp sheets line in the drying process” these input data are required:

Baseline calculation

- Total production;
- Specific diesel consumption in block line;
- Specific steam consumption in block line;
- Specific electricity consumption in block line.

Project calculation

- Total production (baseline value);
- Specific steam consumption in sheet line (baseline value);
- Specific electricity consumption in sheet line (baseline value).

D.3.8 Data to be monitored:

ID number	Baseline	Project	Data Type	Data variable	Data Unit	Measured (m); calculated (c); estimated (e)	Recording frequency	Proportion of data to be monitored	How will be data to be archived (electronic/paper)	For how long is the archived data kept	Comments
EF_S	X	X	Emission factor coefficient	CO_2 emission factor of coal for producing steam in the power plant	tCO_2/t coal	c	year	100%	electronic	During the crediting period	Official data supplied by the power plant
EF_E	X	X	Emission factor coefficient	CO_2 emission factor of the grid	tCO_2/MWh	c	year	100%	electronic	During the crediting period	Determined using the "simple adjusted operating margin"
EF_D	X	X	Emission factor coefficient	CO_2 emission coefficient of Diesel	tCO_2/t Diesel	c	year	100%	electronic	During the crediting period	Determined using IPCC default values
EF_{HFO}	X	X	Emission factor coefficient	CO_2 emission coefficient of Heavy Fuel Oil	tCO_2/t_{HFO}	c	year	100%	electronic	During the crediting period	Determined using IPCC default values
HV_{HFO}	X	X	Fuel heating value	Net calorific value of the Heavy Fuel Oil	MWh/ t coal	c	year	100%	electronic	During the crediting period	Official data supplied by the power plant
HV_C	X	X	Fuel heating value	Net calorific value of the coal	MWh/ t coal	c	year	100%	electronic	During the crediting period	Official data supplied by the power plant
TE_{PP}	X	X	Energy	Thermal efficiency	%	c	year	100%	electronic	During the crediting	Official data supplied by the

ID number	Baseline	Project	Data Type	Data variable	Data Unit	Measured (m); calculated (c); estimated (e)	Recording frequency	Proportion of data to be monitored	How will be data to be archived (electronic/paper)	For how long is the archived data kept	Comments
			efficiency	of power plant						period	power plant
EQ_{BL}	X	X	Energy quantity	Black liquor flow rate	t/h	m	year	100%	electronic	During the crediting period	
HV_{BL}	X	X	Fuel heating value	Net calorific value of black liquor	kcal/kg	c	year	100%	electronic	During the crediting period	
WH_{SRB}	X	X	Working hours	Annual working hours of SRB	h	m	year	100%	electronic	During the crediting period	
OST_{SRB}	X	X	Temperature	Outlet steam temperature from SRB	°C	m	year	100%	electronic	During the crediting period	
OSP_{SRB}	X	X	Pressure	Outlet steam pressure from SRB	bar	c	year	100%	electronic	During the crediting period	
OSE_{SRB}	X	X	Calorific enthalpy	Outlet steam enthalpy from SRB	kJ/kg	c	year	100%	electronic	During the crediting period	
IWE_{SRB}	X	X	Calorific enthalpy	Inlet water enthalpy into SRB	kJ/kg	c	year	100%	electronic	During the crediting period	
IC_{BL}	X	X	moisture	Inlet concentration of black liquor on SRB	%	m	year	100%	electronic	During the crediting period	

ID number	Baseline	Project	Data Type	Data variable	Data Unit	Measured (m); calculated (c); estimated (e)	Recording frequency	Proportion of data to be monitored	How will be data to be archived (electronic/paper)	For how long is the archived data kept	Comments
OC_{BL}	X		moisture	Outlet concentration of black liquor on SRB	%	m	year	100%	electronic	During the crediting period	
OCS_{BL}		X	moisture	Outlet concentration of black liquor on SRB after super concentrator	%	m	year	100%	electronic	During the crediting period	
SQ_{PP}	X	X	Energy quantity	Steam purchase from power plant	MWh	c	year	100%	electronic	During the crediting period	
BLC_{AW}		X	Energy quantity	Black liquor concentration after washing	%	m	year	100%	electronic	During the crediting period	
BLC_{AHE}		X	Energy quantity	Black liquor concentration after heat exchangers	%	c	year	100%	electronic	During the crediting period	
PF_{AP}	X		Energy efficiency	Power factor of actual pumps	kW	m	y	100%	electronic	During the crediting period	Referred to all actual pumps
MC_{AP}	X		Power load	Current intensity of actual pumps	A	m	w	100%	electronic	During the crediting period	Referred to all actual pumps
OH_{AP}	X		Working hours	Operating hours of actual pumps	h	m	w	100%	electronic	During the crediting period	Referred to all actual pumps

ID number	Baseline	Project	Data Type	Data variable	Data Unit	Measured (m); calculated (c); estimated (e)	Recording frequency	Proportion of data to be monitored	How will be data to be archived (electronic/paper)	For how long is the archived data kept	Comments
OH_{VSD}		X	Working hours	Operating hours of pumps	h	m	w	100%	electronic	During the crediting period	Referred to all VSD pumps
PA_{VSD}		X	Power load	Average Power absorbed by pumps	kW	m	w	100%	electronic	During the crediting period	Referred to all VSD pumps
EQ_{E}	X	X	Electricity quantity	Electricity purchased from the grid	MWh	m	year	100%	electronic	During the crediting period	Annual balance of imported and exported electricity.
EG_{ST}		X	Electricity quantity	Electricity generated from steam turbine	MWh	m	year	100%	electronic	During the crediting period	Net-generation of steam turbine.
SP_{SRB}	X	X	Energy quantity	Annual steam production from SRB	t/year	m	year	100%	electronic	During the crediting period	
AR_{BD}		X	Energy efficiency	Average blow-down rate	%	m	year	100%	electronic	During the crediting period	
TI_{HE}		X	Temperature	Temperature inlet heat exchangers	°C	m	year	100%	electronic	During the crediting period	
TO_{HE}		X	Temperature	Temperature outlet heat exchangers	°C	m	year	100%	electronic	During the crediting period	

ID number	Baseline	Project	Data Type	Data variable	Data Unit	Measured (m); calculated (c); estimated (e)	Recording frequency	Proportion of data to be monitored	How will be data to be archived (electronic/paper)	For how long is the archived data kept	Comments
DC_{BL}	X	X	Energy quantity	Specific diesel consumption in block line	t/t pulp	c	year	100%	electronic	During the crediting period	
SC_{SL}	X	X	Energy quantity	Specific steam consumption in sheet line	MWh/t pulp	c	year	100%	electronic	During the crediting period	
EC_{SL}	X	X	Electricity quantity	Specific electricity consumption in sheet line	MWh/t pulp	c	year	100%	electronic	During the crediting period	
FD_{S}	X	X	Energy Quantity	Fuel demand for start-up operations	t	m	year	100%	electronic	During the crediting period	
TP	X	X	Quantity	Pulp production	t	m	year	100%	electronic	During the crediting period	
FD_{EM}	X	X	Quantity	Fuel demand for emergency cases	t	m	year	100%	electronic	During the crediting period	

Table D.1: Data to be collected in order to monitor emissions from the baseline and the project activity, and how this data will be archived

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

It is the responsibility of the operator to develop and implement a management and operational system that meets the requirements of the project. The system proposed and implemented by the operator will be subject to assessment during initial verification to ensure that it is of satisfactory quality to allow project performance in respect of ERUs to be properly verified.

A transparent procedure for the collection and storage of data, including adequate record keeping and data monitoring systems will be established.

For electronic and paper based data entry and record keeping system, there must be clarity in terms of the procedures, workbooks and spreadsheets, so that compliance with requirements can be assessed by a third party.

Particular reference will be drawn to the issue of data uncertainty and scientific and systematic error in monitoring, the impact of uncertain data on reported emissions, and how this is managed.

The operator must appoint a competent manager who will be in charge of and accountable for the generation of ERUs including monitoring, record keeping, computation of ERUs, audits and verification.

The activities outlined will be undertaken under the ISO 9001 quality assurance system.

Svilocell is working under a ISO 14001 certified environmental management system. Copy of the ISO 14001 certification is attached to the PDD as Annex 6.

Proper management processes and systems records will be kept by the operator as the auditors will request copies of such records to judge compliance with the required management systems.

Possible monitoring errors and uncertainties were analysed in the following table and mitigation

Data	Uncertainty level of data (high/Medium/low)	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned
EF_E	Low	Yes	Determined using the "combined margin method" procedure published annually by NEK
EF_D	Low	Yes	Annual revision for updating of IPCC guidelines and default values
HV_C, TE_{PP}, EF_S	Low	Yes	Annual communication from CHP management
EQ_{BL}	Low	Yes	Flow meter will be subject to a regular testing and maintenance regime to ensure accuracy
WH_{SRB}, OH_{AP}	Low	Yes	Counters of operating hours will be subject to a regular testing and

			maintenance regime to ensure accuracy
OST_{SRB}, TI_{HE}, TO_{HE},	Low	Yes	Thermometers will be subject to regular testing and maintenance regime to ensure accuracy
OSP_{SRB}	Low	Yes	Pressure gauge will be subject to regular testing and maintenance regime to ensure accuracy
HV_{BL}, OSE_{SRB}, IWE_{SRB},	Low	Yes	Enthalpy and calorific values will be subject to regular calculations.
EQ_{E}, EG_{ST}, QE_{CWP}, EC_{SL},	Low	Yes	Electricity meters will be subject to regular testing and maintenance regime to ensure accuracy
SQ_{PP}	Low	Yes	Meters will be subject to regular testing and maintenance regime to ensure accuracy
FD_{S}, FD_{EM}	Low	No	These data are considered non-significant for the purpose of calculating emission reductions, so QA/QC procedures are not required.

Table D.2: QA QC procedure for monitoring of errors and uncertainties

Svilocell has a standard operating procedure, titled "Maintenance and control of monitoring equipment", that regulates calibration of monitoring equipment and is integral part of its ISO 9001 certified Quality Management System[21].

All equipment required for measurements of parameters included in the monitoring plan will be included in the existing procedure, if they are not already part of it.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

In the context of JI projects, monitoring describes the systematic surveillance of a project's performance by measuring and recording performance-related indicators relevant to the project or activity.

This Monitoring Plan (MP) defines a standard against which the implementation of the energy efficiency measures performs in terms of its GHG reductions, in conformance with all relevant JI project monitoring criteria.

The MP builds on the baseline scenario identified in the baseline and is fully consistent with it. The MP provides the basis for the projection of the GHG emissions reductions (ERUs) that the project expects to generate over its lifetime.

The MP also provides a practical framework for the collection and management of project performance data which will be used for retrospective verification of actual ERUs generated. Verification is the periodic auditing by a third party of monitoring results, the assessment of achieved

[21] The document is confidential but available to the Validator at request

ERUs and of the project's continued conformance with all relevant project criteria. This MP does not contain specific guidelines on ER auditing and verification, but it provides sufficient detail on the project structure, the proposed data monitoring methodologies and relevant operational issues, to allow an independent verifier to develop suitable auditing and verification procedures for Svilocell.

The MP will constitute integral part of Svilocell Quality Management and will be embedded in overall Standard Operating Procedures at Svilocell.

The MP must be used by the operator when planning and implementing the project activity and during the project's operation. Adherence to the instructions in the MP is necessary for the project operators to measure and track the project impacts and prepare for the verification process that must be undertaken to confirm the achieved ERUs. The MP is thus the basis for the production and delivery of ERUs to the buyer, and for any related revenue stream that the operator expects to receive.

The MP assists the operator in establishing a credible, transparent, and adequate data measurement, collection, recording and management system to successfully develop and maintain the proper information required for the verification and certification of the achieved ERUs and other project outcomes. The MP ensures environmental integrity and accuracy of crediting ERUs by only allowing actual ERUs to be accounted for after they have been achieved. The MP must therefore be used throughout the life of the project by being:

- Adopted as a key input into the detailed planning of the project; and
- Included into the operational manuals of the implemented projects.

The MP can be updated and adjusted to meet operational requirements, provided such modifications are approved by the verifier during the process of initial or periodic verification.

In order to ensure a successful operation of the project and the credibility and verifiability of the ERUs achieved, the project must have a well defined management and operational system. It is the obligation of the operator to put such a system in place for the project. It must include the operation and management of the monitoring and record keeping system that is described in this MP. The proper functioning of the project management and operational system must be monitored by the operator and will be subject to third party verification as far as the ability of the project to generate credible ERUs is concerned. Therefore, the project management responsibilities that concern this MP are outlined in this section.

D.5.1 Allocation of Project Management Responsibilities

The management and operation of the project is the responsibility of the Svilocell pulp mill (the project operator). Ensuring the environmental credibility of the project through accurate and systematic monitoring of the project's implementation and operation, for the purpose of achieving trustworthy ERUs, is the key responsibility of the operator as far as this MP is concerned. It is the operator who will be ultimately held to account for the quality of the ERUs generated.

The project operator will have responsibility to carry out all tests and analyses required under this MP, to procure and install all the necessary equipment and data acquisition systems to enable the collection and of the stipulated data at the required frequency, and to manage and present this data to meet the needs of this MP and the independent verifier.

Independent verifiers will audit the operator and their management systems to ensure credibility and transparency of the project's reported ERUs and other performance indicators.

Activities	Svilocell Operator and Management	Responsible
Monitoring system	Review MP and suggest adjustments if necessary Develop and establish management and operations system Establish and maintain monitoring system and implement MP Prepare for initial verification and project commissioning	Pulp Mill Mgr.
Data Collection	Establish and maintain data measurement and collection systems for all MP indicators Check data quality and collection procedures regularly	Project Mgr.
Data computation	Enter date in MP workbooks Use MP workbooks to calculate emission reductions	Project Mgr.
Data storage systems	Implement record maintenance system Store and maintain records (paper trail) Implement sign off system for completed worksheets Forward monthly and annual worksheet outputs	Project Mgr.
Performance monitoring and reporting	Analyse data and compare project performance with project targets Analyse system problems and recommend improvements (performance management) Prepare and forward periodic reports	Pulp Mill Mgr.
MP Training and Capacity Building	Develop and establish MP training, skills review and feedback system Ensure operational staff trained and enabled to meet needs of MP Consider providing training support to national authorities and other JI projects	Pulp Mill Mgr.
Quality assurance, audit and verification	Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification Prepare for, facilitate and co-ordinate audits and verification process	Quality Mgr.

Table D.3: MP management and operating system

In order to mitigate possible monitoring errors (such as wrong meter readings or input errors) and uncertainties, a double stage control system will be applied.

First, required data will be collected and prepared by the responsible manager for on site data collection. After passing this control, data will be used within the Monitoring Plan Spreadsheet for preliminary GHG emission reduction calculation. The second screening consists of a final approval of preliminary results from the Project Manager.

The person responsible for the collection of the required data, recording and reporting is:

Mr. Atanas Papazov, Project Manager
phone: +359 631 272 2624
fax: +359 631 31141
e-mail: apapazov@svilosa.bg

The person responsible for implementation of monitoring plan and reporting is:

Mr. Iliyan Ilarianov, Pulp Mill Manager
phone: +359 631 316 36
fax: +359 631 31141
e-mail: illarianov@svilosa.bg

D.5.2 Reporting

The operator will prepare reports as needed for annual audit and verification purposes.

A report will be prepared on annual basis, which includes: information on overall project performance, emission reductions generated and verified and comparison with targets, observations regarding MP indicators, compliance with sustainable development targets, calculation methods and other amendments of the MP and the monitoring system.

D.5.3 Training on MP

All personnel involved in the design, construction, commissioning, management and monitoring of the energy efficiency measures that constitute the JI project are to be well trained and aware of role and responsibilities assigned to each of them.

It is the responsibility of Management to ensure that the required capacity and internal training is made available to its operational staff to enable them to undertake the tasks required by this MP.

An energy training needs analysis will be undertaken before the project implementation, in order to ensure all personnel possess the requisite skills required to correctly apply the MP. Wherever the training need analysis shows lacks of technical or managerial competences, training courses will be developed to overcome these gaps.

Initial staff training must be provided before the project starts operating and generating ERs.

The energy management training course discussed at paragraph B.3.2.6 will be an important tool to train the personnel involved in the JI project on methodologies and procedures to be applied in developing the MP.

In the spirit of capacity building and project co-operation, the operator may want to include in training activities staff from government agencies involved in the project and possibly from other Bulgarian entities involved in JI projects.

The trainer for the initial staff training will be a team composed of MWH specialists and energy experts already involved in the energy efficiency audit programme.

D.6. Name of person/entity determining the monitoring methodology:

MWH S.p.A.
Centro Direzionale Milano 2
Palazzo Canova
20090 Milano – Italy
Mr. Eugenio Ferro
Tel. +39 02 21084 375
Fax: +39 02 26924275

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae:

Emissions reductions related to the project activity can be distinguished in three main categories:

1. Emissions reduction deriving from decrease of steam demand supplied by the nearby CHP.
2. Emissions reduction deriving from decrease of power demand supplied by the Bulgarian ESP.
3. Emissions reduction deriving from decrease of diesel fuel consumption

The selected formulae used in calculating the GHG emissions

E.1.2 Description of formulae:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

1- Emissions reduction deriving from decrease of steam demand supplied by the nearby CHP

With regard to Emissions reduction deriving from decrease of steam demand the baseline is the fuel consumption of the technologies that would have been used in absence of the project activity times the emission coefficient for the fossil fuel displaced (coal in this case).

The CHP operator will provide and confirm data for delivered steam, used fuel and fuel demand, emission factor of steam on annual basis.

The formula used is:

$$ER_{coal} = \frac{E_{th} \cdot EF_{coal}}{h \cdot C_{th}}$$

where:

ER_{coal}= Emission reductions [t_{CO2}/year];

E_{th}= Quantity of thermal energy reduced from the baseline [MWh_{th}/year];

EF_{coal}= Emission factor of coal [t_{CO2}/t_{coal}].

C_{th} = Calorific value coal [MWh_{th}/ t_{coal}];

η = CHP efficiency coefficient [%].

2- Emissions reduction deriving from decrease of power demand supplied by the Bulgarian ESP

The baseline is the kWh produced by the generating unit, times an emission coefficient (measured in kg CO_2eq/kWh) calculated in a transparent and conservative manner as the average of the "approximate operating margin" and the "build margin", where:

The "approximate operating margin" is the weighted average emissions (in kg CO_2eq/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation

The "build margin" is the weighted average emissions (in kg CO_2eq/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants."

Because the proposed projects are reducing electricity consumption from the grid, the transmission losses were included in the emissions reductions calculations. The transmission losses in 2003 were more than 14%; in the calculations 10% has been taken as a conservative approach.

OECD recommends to use the weighted mean between the operating margin and build margin for determination of the Baseline. That is based on the assumption that a Joint Implementation Project will very likely have an impact on the operation of an existing and new plant in the short term (marginal operating costs) as well as delay the implementation of a new plant in the longer term (marginal build costs). It will be possible to use a power sector model for forecasting of the build margin as well as of the operating margin.

The baseline methodology refers to the "STUDY ON STANDARD MULTI PROJECT BASELINE FOR JOINT IMPLEMENTATION PROJECTS IN THE BULGARIA POWER SECTOR" prepared by NEK and published on May 5 2005, which is attached as Annex 4.

The study was performed at the request from the Ministry of Environment and Water of Bulgaria. It aims reduction of transaction costs of the JI projects that influence the electricity production and electricity demand in the country.

The applied methodology explores the document of the UNFCCC CDM Executive board ACM0002 "Consolidated Baseline Methodology for Grid-connected electricity generation from renewable sources".

The results are reported for the historical period 2000 – 2004 and for the future period 2005 – 2012.

The historical data are taken from the records of the National Dispatching Center of the Power Grid and from the annual reports of the electricity producers.

The data for the future period are based on the official Least Cost Development Plan of the Bulgaria Power Sector, reported in April 2004[22]. The NEK uses the computer code IRP Manager (Integrated resource planning Manager) that was developed in the United States of America for the purposes of the optimal planning of the power sector and the analysis of the demand side management. The sophisticated software tool allows to model long term period with hourly load diagrams. This allows to get forecast for the annual loading curve by every hour (8760) hours a year) for every of the plants as well as fuel spent.

This methodology considers two different scenarios for calculation of final simple adjusted operating margin emission factor as function of annual electricity demand:

	UoM	2007	2008	2009	2010	2011	2012
Scenario Stagnation – Minimum Demand	$tC0_2$/MWh	1.102	1.017	0.894	0.858	0.849	0.838
Scenario Prosperity - Maximum Demand	$tC0_2$/MWh	1.095	1.006	0.888	0.850	0.834	0.791

Table E.1: Simple adjusted operating margin emission factors

In order to be conservative the maximum demand scenario (with HPP included), which is resulting in lower emission factors, has been considered.

This methodology is officially approved by Ministry of Environment and Water and emission factors are updated and published annually. Annual updating is included in the monitoring plan.

3- Emissions reduction deriving from decrease of diesel fuel consumption

Baseline evaluation of emissions reduction deriving from decrease of diesel consumption is the diesel consumption of the technologies that would have been used in absence of the project activity times the emission coefficient for the diesel displaced. IPCC default value for emission coefficient will be used.

The formula used is:

$$ER_{Diesel} = Q_{Diesel} \cdot EF_D$$

where:

ER_{Diesel}= Emission reductions [t_{CO2}/year];

Q_{Diesel}= Quantity of diesel consumption reduced from the baseline [t_{diesel}/year];

EF_{Diesel}= IPCC emission factor of Diesel [t_{CO2}/t_{diesel}];

Following sections illustrate project emissions calculated for each energy efficiency measure:

Project emission calculation for SVP-01

Project emission (PE_{coal}) is given by the difference between baseline steam purchased from power plant and the difference between steam production on SRB in the project and in the baseline scenarios, times the emission factor of the steam purchased from the power plant (calculated from data supplied by Svilosa[23]).

PE_{coal} is determined ad follow:

$$PE_{coal} = BE_{coal} - \frac{(SP_{SRB-P} - SP_{SRB-B})}{C_{th} \cdot h} \cdot EF_S$$

where:

PE_{coal}= Project emissions [t_{CO2}/year];

BE_{coal}= Baseline emissions [t_{CO2}/year];

SP_{SRB-P}= Quantity of thermal energy production on SRB in the project scenario [MWh_{th}/year];

SP_{SRB-B}= Quantity of thermal energy production on SRB in the baseline scenario [MWh_{th}/year];

C_{th}= Calorific value coal [MWh_{th}/ t_{coal}];

η = power plant thermal efficiency [55%]

EF_S= Emission factor of steam purchased from power plant [tCO_2/ t_{coal}].

[22] "Bulgarian Power Sector least-cost development plan 2004-2020", National Electric Kompany – EAD, Sofia April 2004

[23] 0.395 t CO_2/MWh x 6.5 MWh/t_{coal}

Company: Svilosa AD **Reference:** SVP-01

Efficiency Measure: Reconstruction of Soda Recovery Boiler (SRB) and replacement of cyclone evaporator with a new super concentrator for black liquor

PROJECT EMISSIONS		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Steam production after energy efficiency measures	MWh	218,322	436,644	436,644	436,644	436,644	436,644	
Steam purchased from CHP	MWh	22,821	45,642	45,642	45,642	45,642	45,642	
CO2 emissions from steam consumption	tCO_2	16,416	32,833	32,833	32,833	32,833	32,833	

Table E.2: SVP-01 project emissions

Project emission calculation for SVP-02

Refers to project emission calculation for SVP-01.

Company: Svilosa AD **Reference:** SVP-02

Efficiency Measure: Replacement of a barometryc condensers with plate heat exchangers in evaporating systems for black liquor

PROJECT EMISSIONS		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Steam consumption for evaporation of all water	MWh	46,519	93,038	93,038	93,038	93,038	93,038	From energy efficiency data forms
CO2 emissions from steam consumption	tCO_2	33,463	66,927	66,927	66,927	66,927	66,927	

Table E.3: SVP-02 project emissions

Project emission calculation for SVP-03

Project emission (PE_{VFDs}) is given by the electricity consumption of the VFDs in the project scenario, times an emission coefficient (tCO_2/MWh) calculated in a transparent and conservative manner as the average of the "approximate operating margin" and the "build" margin[24].

PE_{VFDs} is determined as follows:

$$PE_{VFDs} = \frac{EC_{VFDs}}{(1-TL)} \cdot EF_e$$

Where:

PE_{VFDs} = Project emissions [t_{CO2}/year];

EC_{VDFs} = Electricity consumption as a result of the project activity [MWh/year];

TL= Electricity transmission losses [10%];

EF_e= Emission factor from the grid [t_{CO2}/MWh].

[24]For more details refers to paragraph E.1.2.1

Company: Svilosa AD **Reference:** SVP-03

Efficiency Measure: Installation of frequency control drives on electric motors

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Electricity consumption from new motors	MWh	2,025	4,049	4,049	4,049	4,049	4,049	From energy efficiency data forms, including ETL
Electricity demand prior to distribution losses	MWh	2,249	4,499	4,499	4,499	4,499	4,499	
CO2 emissions from electricity consumption	tCO_2	2,463	4,526	3,995	3,824	3,752	3,559	

Table E.4: SVP-03 project emissions

Project emission calculation for SVP-04

Project emission (PE) is given by the difference between baseline electricity consumption and the electricity that will be generated by the back pressure steam turbine, times an emission coefficient (tCO_2/MWh) calculated in a transparent and conservative manner as the average of the "approximate operating margin" and the "build" margin[25].

PE is determined as follows:

$$EG_{ST} = O_h \cdot E_p \cdot L_f \cdot (1 - T_{ec})$$

$$PE = \frac{(B_{el} - EG_{st})}{(1 - TL)} \cdot EF_e$$

Where:

EG_{ST} = Back pressure steam turbine electricity production [MWh/year];

O_h = Operating hours [h/year];

E_p = Electric power of the back pressure steam turbine [6.2 MW_e];

L_f = Load factor [0.83]

T_{ec}= electricity consumption as a result of the project activity [MWh/year];

B_{el} = Baseline electricity consumption [MWh/year];

TL= Electricity transmission losses [10%];

EF_e= Emission factor from the grid [t_{CO2}/MWh]

[25] For more details refers to paragraph E.1.2.1

Company: Svilosa AD **Reference:** SVP-04

Efficiency Measure: Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Electricity generated from steam turbine	MWh	19,939	39,878	39,878	39,878	39,878	39,878	From energy efficiency data forms
Electricity purchased from the grid	MWh	34,456	68,912	68,912	68,912	68,912	68,912	
Electricity demand prior to distribution losses	MWh	38,284	76,568	76,568	76,568	76,568	76,568	
CO2 emissions from electricity consumption	tCO_2	41,921	77,028	67,993	65,083	63,858	60,566	

Table E.5: SVP-04 project emissions

Project emission calculation for SVP-05

It refers to project emission calculation for SVP-01.

Company: Svilosa AD **Reference:** SVP-05

Efficiency Measure: Installation of blow down heat recovery system for SRB

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Heat dissipated through water blow down	MWh	99	197	197	197	197	197	Considering 95% HX efficiency
CO2 emissions from steam consumption	tCO_2	253	506	506	506	506	506	

Table E.6: SVP-05 project emissions

Project emission calculation for SVP-06

Project emissions (PE) is given by the electrical demand, the thermal demand and the fuel demand of the additional pulp sheets production after line switching, times their emission coefficients (tCO_2/MWh) calculated in a transparent and conservative manner.

PE is determined as follows:

$$SC_{PS} = SSC_{PS} \cdot PS_P$$

Where:

SC_{PS}= Steam consumption in project scenario [MWh/year];

SSC_{PS}= Specific Steam consumption in Project scenario [0.84 MWh/t_{pulp}];

PS_P= Additional annual sheet pulp production after line switching [t_{pulp}/year].

$$EC_{PS} = \frac{SEC_{PS} \cdot PS_P}{(1-TL)}$$

Where:

EC_{PS}= Electricity consumption in project scenario [MWh/year];

SEC_{PS}= Specific Electricity consumption in project scenario [0.16 MWh/t_{pulp}];

PS_P= Additional annual sheet pulp production after line switching [t_{pulp}/year].

TL= Electricity transmission losses [10%];

$$DC_{PS} = SDC_{BL} \cdot HV_D \cdot PS_P$$

Where:

DC_{PS}= Diesel consumption in project scenario [MWh/year];

SDC_{BL}= Specific Diesel consumption in project scenario [0.00 t_{diesel}/t_{pulp}];

HV_D= Diesel Heating Value [12.04[26] MWh/t_{diesel}];

PS_P= Additional annual sheet pulp production after line switching [t_{pulp}/year].

$$PE = \frac{SC_{PS} \cdot}{h \cdot C_{th}} \cdot EF_s + EC_{PS} \cdot EF_e + \frac{DC_{PS}}{HV_D} \cdot EF_D$$

Where:

PE= Project emissions from steam, electricity and fuel consumption [t_{CO2}/year];

SC_{PS}= Steam consumption in project scenario [MWh/year];

C_{th}= Calorific value coal [MWh_{th}/t_{coal}];

η = power plant thermal efficiency [55%]

EF_S= Emission factor of steam purchased from power plant [tCO_2/t_{coal}];

EC_{PS}= Electricity consumption in project scenario [MWh/year];

EF_e= Emission factor from the grid [t_{CO2}/MWh];

DC_{PS}= Diesel consumption in project scenario [MWh/year];

HV_D= Diesel Heating Value [12.04 MWh/t_{diesel}];

EF_D= emission factor of Diesel [tCO_2/t_{Diesel}];

Company: Svilosa AD 9,403 **Reference:** SVP-06

Efficiency Measure: Shift of production from pulp blocks to pulp sheets

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Total production	ton pulp	110,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in Aug 2006
Additional pulp sheets production after line switching	ton pulp	64,406	64,406	64,406	64,406	64,406	64,406	
Steam consumption from Power Plant	MWh	54,101	54,101	54,101	54,101	54,101	54,101	From energy efficiency data forms
Electricity consumption	MWh	11,450	11,450	11,450	11,450	11,450	11,450	From energy efficiency data forms, including ETL
Diesel consumption	MWh	0	0	0	0	0	0	From energy efficiency data forms
CO2 emissions from steam consumption	$tC0_2$	38,918	38,918	38,918	38,918	38,918	38,918	
CO2 emissions from electricity consumption	$tC0_2$	12,538	11,519	10,168	9,732	9,549	9,057	
CO2 emissions from diesel consumption	$tC0_2$	0	0	0	0	0	0	
Total CO2 emissions	$tC0_2$	51,455	50,436	49,085	48,650	48,467	47,975	

Table E.8: SVP-06 project emissions

Total emissions produced by source in the project scenario are: 1,246,099 ton CO_2.

[26] Revised 1996 IPCC Guidelines for Nat.l GHG inventories.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category

According to conclusion achieved at paragraph B.4 there are no relevant indirect on-site and off-site emission sources (leakage) for this JI project.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

As no leakage is identified, the sum of E.1.2.1 and E.1.2.2 equals E.1.2.1 = 1,246,099 ton CO_2

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category:

General formulae are the same described at paragraph E.1.2.1.

Following sections illustrate baseline emissions calculated for each energy efficiency measure:

Baseline emission calculation for SVP-01

Baseline emission (BE_{coal}) is given by the baseline steam purchased from power, times the emission factor of the steam purchased from the power plant (calculated as in the project scenario).

BE_{coal} is determined as follows:

$$BE_{coal} = \frac{SQ_{PP}}{C_{th} \cdot h} \cdot EF_S$$

where:

BE_{coal}= Baseline emissions [t_{CO2}/year];

SQ_{PP}= Quantity of thermal energy purchased from power plant [MWh_{th}/year];

C_{th}= Calorific value coal [MWh_{th}/t_{coal}];

η = power plant thermal efficiency [55%]

EF_S= Emission factor of steam purchased from power plant [t_{CO2}/t_{coal}].

Company: Svilosa AD **Reference:** SVP-01

Efficiency Measure: Replacement of cyclone evaporator with a new super concentrator for black liquor in Soda Recovery Boiler

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Steam production from SRB	MWh	191,060	382,120	382,120	382,120	382,120	382,120	From energy efficiency data forms
Steam purchased from CHP	MWh	50,083	100,166	100,166	100,166	100,166	100,166	
CO2 emissions from steam consumption	tCO_2	36,027	72,054	72,054	72,054	72,054	72,054	

Table E.9: SVP-01 baseline emissions

Baseline emission calculation for SVP-02

Refers to baseline emission calculation for SVP-01.

Company: Svilosa AD **Reference:** SVP-02

Efficiency Measure: Replacement of a barometryc condensers with plate heat exchangers in evaporating systems for black liquor

BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Steam consumption for evaporation of all water	MWh	69,864	139,727	139,727	139,727	139,727	139,727	From energy efficiency data forms
CO2 emissions from steam consumption	tCO_2	50,256	100,513	100,513	100,513	100,513	100,513	

Table E.10: SVP-02 baseline emissions

Baseline emission calculation for SVP-03

Baseline emission (BE) is given by the electricity consumption of the electric motors mounted at the feed water pumps, times an emission coefficient (tCO_2/MWh) calculated in a transparent and conservative manner as the average of the “approximate operating margin” and the “build” margin.

BE_{VFDs} is determined as follows:

$$BE_{VFDs} = \frac{EC_{CM}}{(1-TL)} EF_c$$

Where:

BE_{VFDs} = Baseline emissions [t_{CO2}/year];

EC_{CM} = Electricity consumption as a result of the baseline activity[27] [MWh/year];

TL= Electricity transmission losses [10%];

EF_e= Emission factor from the grid [t_{CO2}/MWh].

Company: Svilosa AD **Reference:** SVP-03

Efficiency Measure: Installation of frequency control drives on electric motors

BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Electricity consumption from current motors	MWh	2,660	5,319	5,319	5,319	5,319	5,319	From energy efficiency data forms, including ETL
Electricity demand prior to distribution losses	MWh	2,955	5,910	5,910	5,910	5,910	5,910	
CO2 emissions from electricity consumption	tCO_2	3,236	5,945	5,248	5,024	4,929	4,675	

Table E.11: SVP-03 baseline emissions

Baseline emission calculation for SVP-04

Baseline emission (BE) is given by the electricity that will be supplied by CHP power plant[28] without considering EE measures, times an emission coefficient (tCO2/MWh) calculated in a transparent and conservative manner as the average of the “approximate operating margin” and the “build” margin.

[27] For details refers to the energy efficiency data form.

BE is determined as follows:

$$B_{el} = P_p \cdot E_d$$

$$BE = \frac{B_{el}}{(1 - TL)} \cdot EF_e$$

Where:

BE = Baseline emission production [t_{CO2}/year]

P_P = Annual pulp production [t_{pulp}/year];

E_d = Electricity production demand [MWh/t_{pulp}];

TL= Electricity transmission losses [10%];

EF_e= Emission factor from the grid [t_{CO2}/MWh]

Company: Svilosa AD **Reference:** SVP-04

Efficiency Measure: Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity

		Year						
BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Electricity purchased from the grid	MWh	54,395	108,790	108,790	108,790	108,790	108,790	Considering 989 kWh/t pulp
Electricity demand prior to distribution losses	MWh	60,439	120,878	120,878	120,878	120,878	120,878	
CO2 emissions from electricity consumption	$tC0_2$	66,181	121,603	107,339	102,746	100,812	95,614	

Table E.12: SVP-04 baseline emissions

Baseline emission calculation for SVP-05

Refers to baseline emission calculation for SVP-01.

Company: Svilosa AD **Reference:** SVP-05

Efficiency Measure: Installation of blow down heat recovery system for SRB

		Year						
BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	55,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in June 2007
Operating hours for SRB	hr.	4,020	8,040	8,040	8,040	8,040	8,040	Site data
Heat dissipated through water blow down	MWh	1,973	3,946	3,946	3,946	3,946	3,946	From energy efficiency data forms
CO2 emissions from steam consumption	$tC0_2$	1,419	2,838	2,838	2,838	2,838	2,838	

Table E.13: SVP-05 baseline emissions

Baseline emission calculation for SVP-06

[28] This value was estimated considering the actual annual energy consumption and the planned expansion of production from 55,000 ton/year to 110,000 t/y.

Baseline emission (BE) is given by the electrical demand, the thermal demand and the fuel demand of the pulp block production in the baseline scenario, times their emission coefficients (tCO_2/MWh) calculated in a transparent and conservative manner.

BE_{el} is determined as follows:

$$SC_{BL} = SSC_{BL} \cdot PB_P$$

Where:

SC_{BL}= Steam consumption in baseline scenario [MWh/year];

SSC_{BL}= Specific Steam consumption in baseline scenario [0.96 MWh/t_{pulp}];

PB_P= Baseline Pulp Block annual production [t_{pulp}/year].

$$EC_{BL} = \frac{SEC_{BL} \cdot PB_P}{(1-TL)}$$

Where:

EC_{BL}= Electricity consumption in baseline scenario [MWh/year];

SEC_{BL}= Specific Electricity consumption in baseline scenario [0.28 MWh/t_{pulp}];

PB_P= Baseline Block Pulp annual production [t_{pulp}/year].

TL= Electricity transmission losses [10%];

$$DC_{BL} = SDC_{BL} \cdot HV_D \cdot PB_P$$

Where:

DC_{BL}= Diesel consumption in baseline scenario [MWh/year];

SDC_{BL}= Specific Diesel consumption in baseline scenario [0.04 t_{diesel}/t_{pulp}];

HV_D= Diesel Heating Value [12.04[29] MWh/t_{diesel}];

PB_P= Baseline Block Pulp annual production [t_{pulp}/year].

$$BE = \frac{SC_{BL} \cdot}{h \cdot C_{th}} \cdot EF_s + EC_{BL} \cdot EF_e + \frac{DC_{BL}}{HV_D} \cdot EF_D$$

Where:

BE= Baseline emissions from steam, electricity and fuel consumption [t_{CO2}/year];

SC_{BL}= Steam consumption in baseline scenario [MWh/year];

C_{th}= Calorific value coal [MWh_{th}/t_{coal}];

η = power plant thermal efficiency [55%]

EF_S= Emission factor of steam purchased from power plant [t_{CO2}/t_{coal}];

EC_{BL}= Electricity consumption in baseline scenario [MWh/year];

EF_e= Emission factor from the grid [t_{CO2}/MWh];

DC_{BL}= Diesel consumption in baseline scenario [MWh/year];

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[29] Revised 1996 IPCC Guidelines for Nat.l GHG inventories.

HV_D= Diesel Heating Value [12.04 MWh/t_{diesel}];

EF_D= Emission factor of Diesel [t_{CO2}/t_{diesel}];

Company: Svilosa AD **Reference:** SVP-06

Efficiency Measure: Shift of production from pulp blocks to pulp sheets

BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	110,000	110,000	110,000	110,000	110,000	110,000	Commisioning expected in Aug 2006
Pulp blocks production	ton pulp	64,406	64,406	64,406	64,406	64,406	64,406	
Steam consumption from Power Plant	MWh	61,830	61,830	61,830	61,830	61,830	61,830	From energy efficiency data forms
Electricity consumption	MWh	20,037	20,037	20,037	20,037	20,037	20,037	From energy efficiency data forms, including ETL
Diesel consumption	MWh	31,008	31,008	31,008	31,008	31,008	31,008	From energy efficiency data forms
CO2 emissions from steam consumption	$tC0_2$	44,477	44,477	44,477	44,477	44,477	44,477	
CO2 emissions from electricity consumption	$tC0_2$	21,941	20,158	17,793	17,032	16,711	15,850	
CO2 emissions from diesel consumption	$tC0_2$	8,275	8,275	8,275	8,275	8,275	8,275	
Total CO2 emissions	$tC0_2$	74,694	72,910	70,546	69,785	69,464	68,602	

Table E.14: SVP-06 baseline emissions

Total emissions produced by source in the baseline scenario are: 2,014,082 ton CO_2.

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Total emission reductions due to the project activity during the crediting period (2007-2012) are:

767,983 ton CO_2

E.2 Table providing values obtained when applying formulae above:

Company: Svilosa AD **Reference:** SVP-CONS

Efficiency Measure: Total ERUs form Project Activity

EMISSIONS REDUCTION		2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	$tC0_2$	231,813	375,864	358,539	352,960	350,610	344,297	Total baseline emissions 2007-2012= 2,014,082
Project scenario emission	$tC0_2$	145,973	232,256	221,339	217,823	216,343	212,365	Total project emissions 2007-2012= 1,246,099
Total project emission reduction	$tC0_2$	85,840	143,608	137,200	135,136	134,267	131,932	Total ERUs 2007-2012= 767,983

Table E.15: Total emissions scenario during the crediting period (2007-2012)

Figures E.1 and E.2 show respectively the annual emission reductions and the breakdown of emission reduction for each energy efficiency measure.

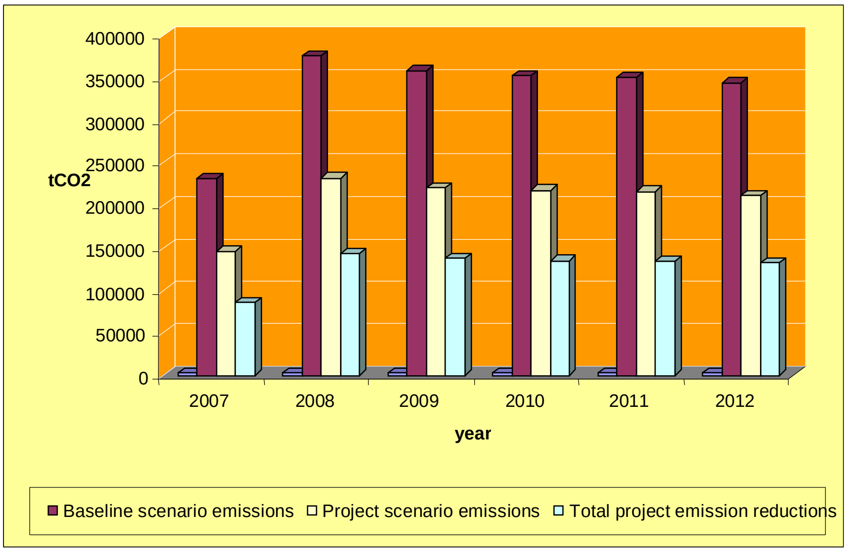

Figure E.1: Total emissions scenario during the crediting period (2007-2012)

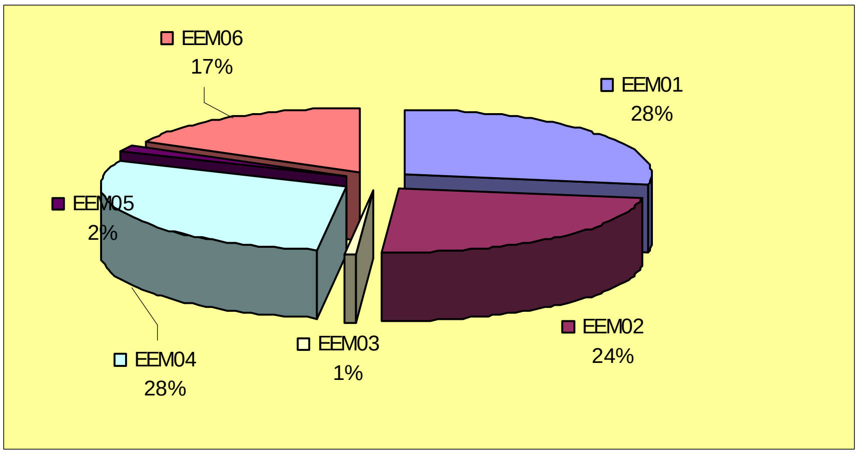

Figure E.2: Breakdown emission reductions for EE measure

SECTION F.: Environmental impacts:

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

The investment program is largely environmentally oriented, improves the efficiency in use of resources and modern technology will be applied. An Environmental Audit and an Environmental Analysis were undertaken in accordance with EBRD's requirements by independent environmental consultants.

The investigations included an environmental site assessment, a field survey of the project area and its surroundings, a Best Available Technology ("BAT") assessment and an assessment of the environmental impacts of the project. The investigations showed that the project has been structured to meet EU BAT environmental standards and that trough the use of BAT the emissions and discharges to the environment can be reduced from the present level despite the planned increase in production. Other than the reduction of CO_2 emissions, the key environmental benefits are: (i) reduced air pollutants; (ii) reduced water consumption; and (iii) reduced BOD in waste water. Especially the SRB will reduce the air pollution from the plant. Some of the elements that increase the environmental out put are:

- a new electric filter and new scrubber for flue gases;
- a new flue gases fan will extract the gases from the boiler; and
- new system for green liquor – stirrers for the melt solvent, scrubber for catching vapours above solvent.

The table below shows the environmental effect from carrying out the reconstruction of the soda recovery boiler.

Substance	UoM	Before	After
Dust	mg/nm^3	up to 400	up to 50
Sulphur dioxide	mg/nm^3	no measurements	50
Nitrogen dioxide	mg/nm^3	up to 300	120

Table F.1: Effects of new SRB on environmental emissions

The Debarking unit will lead to a reduced water consumption of about 70% compared to current usage and further environmental benefit will come from reducing the BOD content in the effluent produced.

The implementation of this Project offers a number of socio-economic impacts to the region.

- the investment will increase economic activity by use of local civil engineering and related contractors for the implementation of the project;
- the project will increase the overall resource efficiency and therefore will strengthen the market position of Svilocell. This will increase the job security of the people directly or indirectly dependent on the plant.

Svilosa made an inquiry to the Ministry of Environment and Waters and they answered that an environmental analysis was not required for the new projects. With regard to environmental and construction permit, application has been already submitted and the permit is likely to be issued in mid 2006.

SECTION G. Stakeholders' comments:

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

Svilosa published the Environmental issues of the extension project, which were also disclosed on the company web site at the address: http://www.svilosa.bg/language1/ecology/resume.htm

Here below is reported the English translation of the project description published on the web site.

"Svilosa Pulp mill

Environmental Review Summary

1. Description of the Project

Svilosa Pulp mill (the "Company") is planning to implement a development programme to increase its annual pulp production capacity from current 55,000 tonnes up to 120,000 tonnes, to make the necessary upgrades to comply with the forthcoming EU environmental standards based on the use of Best Available Techniques (BAT) and to improve energy efficiency of its operations. The Company has requested the European Bank of Reconstruction and Development (the "EBRD") to provide loan financing to support the development programme. In accordance with EBRD's Environmental Policy, environmental investigations have been undertaken to assess the current environmental status of the site and environmental impacts associated with the project.

2. Screening categories and rationale for classification

An Initial Environmental Examination conducted by the Bank's environmental specialist showed that the mill location and operations are not associated with sensitive environmental, health and safety issues and that the environmental impacts of the project can be readily identified, assessed and mitigated. The introduction of BAT will reduce the emissions and discharges to the environment from the present level despite the planned production increase. The operation involves existing facilities and operations, which may be associated with significant EHS issues. For the above mentioned reasons, the EBRD has classified the project B/1, requiring an Environmental Analysis and an Environmental Audit.

3. Information reviewed during the environmental appraisal

The environmental appraisal has been based on the review of the Environmental Analysis and Audit undertaken by international environmental consultant in accordance with the EBRD's requirements in May 2005. The investigations included an environmental site assessment, a field survey of the project area and its surroundings, a BAT assessment and an assessment of the environmental *impacts of the project. The EBRD environmental specialist visited the site and reviewed also other supportive technical and environmental documentation.*

4. Key environmental issues and mitigation

Following the transposition of EU Integrated Pollution Prevention and Control (IPPC) Directive into Bulgarian law, Svilosa has been issued an IPPC permit requiring it to meet environmental standards achievable with the use of Best Available Techniques (BAT) for Pulp and Paper Manufacturing by October 2007. The project is largely oriented at financing the investments required for meeting the EU BAT environmental standards. The investigations showed that although the production will be approximately doubled, the introduction of BAT will reduce the emissions and discharges to the environment from the present levels. Air emissions of sulphur dust and malodorous gases will be reduced by upgrading of the evaporation plant, installing electrostatic precipitators for the recovery boiler and the lime kiln, and installing a collection and recovery system for high concentration malodorous gases from the pulp line. The process modernisations and upgrades will improve resource and energy efficiency as well as reduce water consumption and wastewater discharges. Also external environmental protection measures will be implemented, including a mechanical wastewater treatment plant and measures to improve waste management.

The key indirect environmental impact of the plant will arise from the consumption of a considerable amount, up to 460,000 m^3/a, of round wood. The Company uses mainly small diameter hardwood (oak, beech and acacia), which has little or no other use in Bulgaria. In addition, saw dust and sawmill residues can be used to substitute some of the round wood. To mitigate the adverse impact of the wood procurement and to ensure the wood is of legal origin, the Company will adopt and implement wood procurement procedures that are based on principles of sustainable forestry, ensuring that:

- *the wood does not originate from statutory protected forests, forest areas included in nature conservation programmes or sites which have been notified by the authorities to be excluded from felling;*
- *the origin of the wood is monitored;*
- *suppliers operate according to the principles of sustainable development, in compliance with the legislation currently in force and under the supervision of state authorities; and*
- *the biodiversity and the functions of the forest ecosystem are maintained in accordance with internationally and nationally approved principles.*

5. Summary of Environmental Action Plan

An Environmental Action Plan has been developed as part of the environmental due diligence to ensure the mill will reach full BAT-level environmental performance within acceptable timeframe. The EAP includes measures for further improving the wastewater treatment (biological treatment), malodorous gas collection (low concentration) and dust emission control as well as for improving *waste management. The EAP also includes a programme for setting up a wood procurement control system ensuring sustainable use of forest resources.*

6. Disclosure of Information and Consultation

In accordance with the Bulgarian environmental permitting procedure information of the project and the present activities of the mill has been disclosed to public on the local level for the purpose of getting possible comments from the potentially affected individuals and groups. Local newspapers have reported on the mill's activities. In the context of EBRD's potential participation in the project, this summary describing the relevant environmental issues associated with the project and the mitigation measures has been disclosed locally.

7. Monitoring

The Company will systematically monitor and report its environmental and health and safety impacts in accordance with BAT guidelines to ensure it complies with Bulgarian/EU environmental standards. The EBRD will evaluate the project's compliance with the applicable environmental and social requirements during the lifetime of the project by reviewing annual environmental reports prepared by the Company, describing ongoing of project-specific environmental, health and safety performance, and by conducting periodic monitoring visits. "

G.2. Summary of the comments received:

No comments were received.

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

No specific objections or comments were received in the initial phase of public consultation.

Annex 1

EMISSION REDUCTION SPREADSHEET

Annex 2

ENERGY EFFICIENCY DATA FORM

Annex 3

MONITORING PLAN SPREADSHEET

Annex 4

NATSIONALNA ELEKTRICHESKA KOMPANIA - BASELINE STUDY OF JOINT IMPLEMENTATION PROJECTS IN THE BULGARIAN ENERGY SECTOR

Annex 5

LETTER OF SUPPORT FROM MINISTRY OF ENVIRONMENT AND WATER

Annex 6

COPY OF ISO 14001 EMS CERTIFICATION