Investment Analysis

The following calculations show the economic efficiency of the project with revenues obtained from emissions trading. The calculations show that without revenues from emissions trading a loss of about 640 thousands EUR is "earned" (NPV (15%)). Considering revenues from emissions trading, an internal rate of return of about 32.8 % is given, at which a price of 8.00 EUR per ERU has been presumed. The return of investment adds up to 5 years
Furthermore a sensitivity analysis has been carried out, showing the influence of the three main factors of influence: Investment (capex), operating costs (opex) und operating hours (production) on the Internal Rate of Return IRR. The factors have been varied in a range of +/-20 %

The project is not viable without revenues from emissions trading because the expenses are higher than the income. The comparison of income and expenses is shown in table 2. The expenses consist of the payback of the investment and significantly involved the operation costs of the plants (opex). The costs are significantly accelerated by the high inflation rate in Ukraine. The income consists of the revenues from selling ERU's and saved money for coal for heat generation.

In the table 1, an overview on the input parameters used for the investment analysis is given.

1. The values for investment (capex), loan interest und operating costs (opex) have been determined by the project developer (Eco-Alliance) together with Shakhtoupravlenye Donbassa.
2. The interest has been excluded from the calculation.
3. The inflation rate of Ukraine has been taken from the CIA's World fact book for the year 2005 [CIA].
4. The fiscal system is complicated in Ukraine. E.g. the taxes are different for work-related and production-related incomes; there are also corporation, property taxes etc. Resuming several taxes of Ukraine an average tax of 33 % has been put in calculation [DEMETA].
5. The price of 8.00 EUR per ERU has been estimated by Eco-Alliance, based on the actual price development.
6. The depreciation time is 10 years. Considering the project start in 2006, loan repayment starts in 2007 and the production ends in 2016.
7. The price of 8.00 EUR /MWh for heat is an internal cost rate of the coal mine including external costs and internal surcharges or reductions. The price is highly affected by the coal price, which is actually about 30-40 EUR/t. [SU Donbass]
8. The price for power results from a mix of the day, afternoon and night tariffs and is actually about 40.00 EUR/MWh (see figure 7). In the calculation a price of 35.00 EUR/MWh has been taken into account, according to the price corresponding to that, at the time of the management decision to start the project.
9. The efficiency of the coal fired boiler is set to 73.5 % as declared by the manufacturer.
10. The depreciation has been only taken into account for the calculation of the taxes and is not included in the cash flow. The interest rate of 15% is corresponding to the mean value given by the Bank of Ukraine http://www.bank.gov.ua.

The calculations are carried out assuming that:

- the first investment has been done in 2006 – the installation of the gas pipelines to the boilers and the ventilation air heater and the first rough-and-ready "burning system".
- the upgrade of the boilers and the ventilation air heater with CMM burning systems will be done in 2007 and the operation will also start in 2007
- the flares will be installed in 2007 and will start operation in 2008

- the investment for the gas engines will be done in 2008 and the production will start in the second half of 2008

The investment for the flares mainly consists of the price of the flare, import certification, transportation to Ukraine, import taxes, installation, piping, electric cables and initial operation. An estimated value of 300.000 EUR per flare has been taken into account.

The investment for the CMM burner systems mainly consists of the price of the burner system, the modification of the old boilers, import certification, transportation to Ukraine, import taxes, installation, piping, electric cables and initial operation. An estimated value of 300.000 EUR per burner has been taken into account.

For the installation of the new cogeneration unit and the general overhaul of the emergency power generator a value of 1 million EUR per 1 MW has been taken into account. This value is a first estimation value, which has been established by the experience made on similar projects in Germany.
1.35 MW + 0.4 MW = 1.75 MW -> 1,750,000 EUR.
The costs for the overhaul of the emergency power generator were missed in the previous version and are now included.

The estimated operation costs include wages for the maintenance personnel, operating resources, spare parts, insurances, regular acceptance inspections, emission measurements etc.
In case of the gas engines fresh motor oil and waste oil, sparks, valves etc. are important cost factors.

Table 1: Input parameters

Shcheglovskaya-Glubokaya Input Economics Avoided CO2-Emissions by using Coal Mine Methane				
firing capacity [MWh]	[%]	[m3]	[t]	CO2eq [t]
110,989	100	11,122,294	7,975	**145,538**
			GHP 21 in Calculation= 18.25	
CO2-Equivalent by power generation (Avoided emissons in power stations)				
produced power [MWh]	spec.			CO2eq [t]
9,422	0.896			**8,442**
power consumption				
330	0.807			**266**
CO2-Equivalent by heat generation (Avoided emissions in heat plants)				
produced heat [MWh]	spec.	efficiency		CO2eq [t]
45,529	0.3406	73.5		**21,098**
calorific value Methane 9,979 KWh/m3				
gained environmental effect in t CO2				**174,813**

Revenues:	**EUR/kWh**	Rev/year
Heat	0.008	364,232
Power	0.035	329,784

Project	Year
Investment	2006
Production Start	2008
Production End	2017

	Cost / Unit	Total cost		
Capex flaring	300,000	600,000	EUR	Sensitivity Capex
Capex heat production	900,000	900,000	EUR	1
Capex CHP unit	1,000,000	1,750,000	EUR	
Total Capex		**3,250,000**	EUR	
		Total cost per year		
Opex flaring	50,000	100,000	EUR	Sensitivity Opex
Opex heat production (EUR/kWh)	0.0011	50,082	EUR	1
Opex CHP (EUR/kWh)	0.03	282,672	EUR	
Opex total		**432,754**	EUR	
				Sensitivity Production
				1
Depreciation Time	10			
Interest	15%			
Percentage of Debt Fin.	100%			
Repayment Time Loan years	10			
Tax Rate	33%			
Inflation rate OPEX	11%			

Economic Parameters - Shcheglovskaya		
IRR	**32.76**	**%**
NPV (0 %)	**6,796,254**	**EUR**
NPV (15 %)	**1,615,097**	**EUR**

Revenues from ERUs	1,398,500
ERU Volume	174,813
ERU Price [EUR/t]	8.00

Table 2: Cash flow of the project including revenues from selling ERU's

Year	Investment EUR	Opex EUR	Interest EUR	Loan Repayment EUR	Income Tax EUR	Rev. Power EUR	Rev. Heat EUR	Rev. ERU EUR
2006	300,000	0	0	0	0	0	0	0
2007	1,200,000	50,000	45,000	30,000	0	0	50,000	0
2008	1,750,000	533,196	220,500	150,000	0	203,163	448,770	0
2009	0	591,848	460,500	325,000	212,371	451,023	498,135	1,398,500
2010	0	656,951	411,750	325,000	349,260	500,635	552,930	1,398,500
2011	0	729,215	363,000	325,000	379,745	555,705	613,752	1,398,500
2012	0	809,429	314,250	325,000	411,813	616,833	681,265	1,398,500
2013	0	898,466	265,500	325,000	445,639	684,684	756,204	1,398,500
2014	0	997,298	216,750	325,000	19,912	760,000	839,386	0
2015	0	1,107,000	168,000	325,000	57,855	843,600	931,719	0
2016	0	1,228,771	119,250	325,000	98,202	936,396	1,034,208	0
2017	0	1,363,935	70,500	295,000	151,118	1,039,399	1,147,971	0
2018	0	0	26,250	175,000	0	0	0	0

Table 3: Cumulated cash flow of the project including revenues from selling ERU's

Year	Cash Out EUR	Cash In EUR	Cashflow incl. Financing EUR	Cashflow cumulated EUR	FreeCash aft. Amort. EUR
2006	300,000	0	-300,000	-300,000	
2007	1,250,000	50,000	-1,200,000	-1,500,000	-1,230,000
2008	2,283,196	651,934	-1,631,262	-3,131,262	-1,781,262
2009	804,219	2,347,658	1,543,440	-1,587,823	1,218,440
2010	1,006,211	2,452,065	1,445,854	-141,969	1,120,854
2011	1,108,960	2,567,958	1,458,997	1,317,029	1,133,997
2012	1,221,242	2,696,598	1,475,356	2,792,384	1,150,356
2013	1,344,106	2,839,389	1,495,283	4,287,667	1,170,283
2014	1,017,209	1,599,386	582,177	4,869,844	257,177
2015	1,164,855	1,775,319	610,463	5,480,307	285,463
2016	1,326,973	1,970,604	643,631	6,123,938	318,631
2017	1,515,054	2,187,370	672,316	6,796,254	377,316
2018	0	0	0	0	-175,000

Table 4: Economic parameters of the project including ERU's

Economic Parameters – Shcheglovskaya incl. ERU's		
IRR	**32.76**	**%**
NPV (0 %)	**6,796,254**	**EUR**
NPV (15 %)	**1,615,097**	**EUR**

The cash flow and the economic parameters of the project including revenues from selling ERU's are listed in the tables 2, 3 and 4. Including the revenues from emissions trading the project gains an internal rate of return of about 32.8%. Without revenues from emissions trading a loss of approx. 640 thousands EUR is "earned", as shown in table 5.

Table 5: Economic parameters of the project without ERU's

Economic Parameters – Shcheglovskaya without ERU's		
IRR	8.30	%
NPV (0 %)	1,929,669	EUR
NPV (15 %)	-638,280	EUR

The sensitivity of the project is shown in figure 6. The main three factors: production, investment (capex) and operating costs (opex) have been changed within a range of +/- 20 % in steps of 5 %, and the influence on the internal rate of return has been calculated.

As shown in figure 6, the IRR vary in a range from 25% to 40% in the case with ERU's. Without ERU´s the maximum of the IRR is about 13.8% in the case of OPEX -20% and 8.3% in the base case.

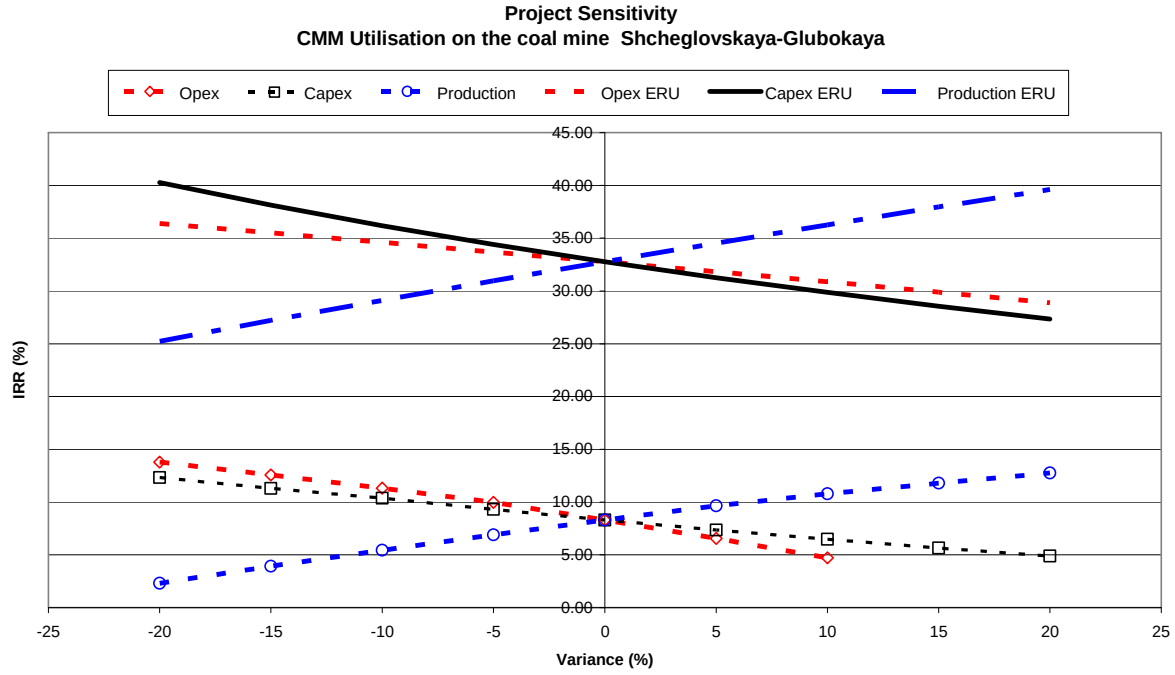
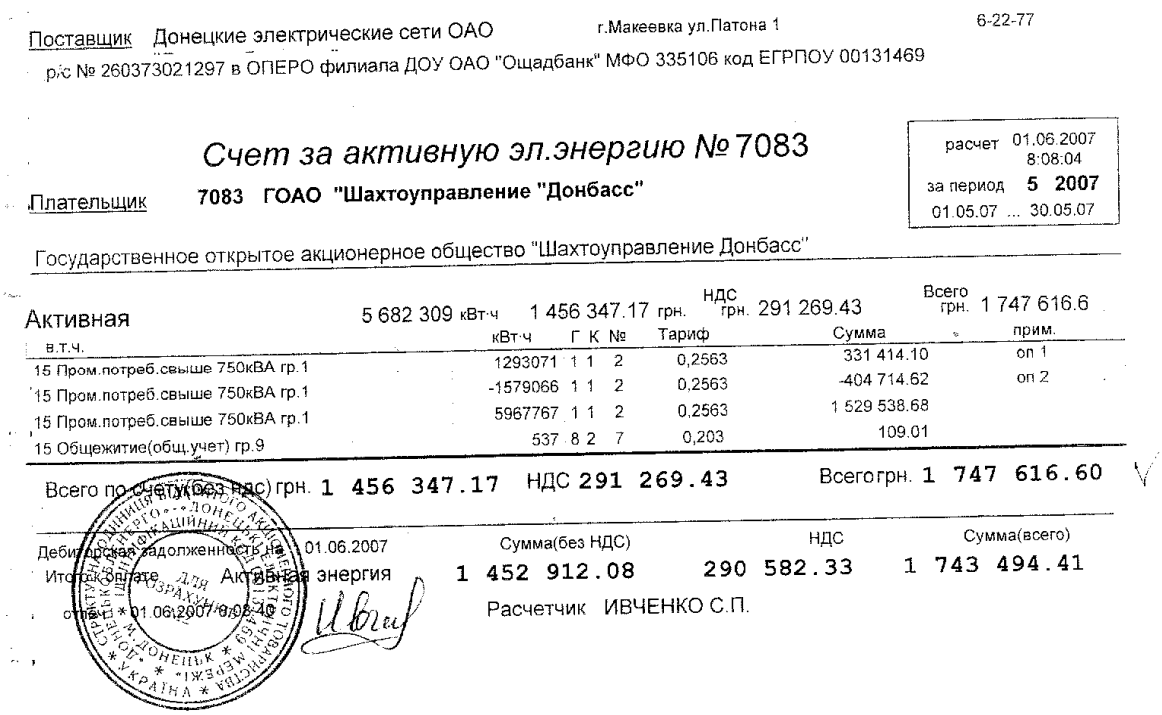


Figure 6: Influence of production, investment (capex) and operating costs (opex) on the internal rate of return. The three factors have been changed within a range of +/- 20 %



Поставщик Донецкие электрические сети ОАО г.Макеевка ул.Патона 1 6-22-77

р/с № 260373021297 в ОПЕРО филиала ДОУ ОАО "Ощадбанк" МФО 335106 код ЕГРПОУ 00131469

Счет за активную эл.энергию № 7083

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Плательщик 7083 ГОАО "Шахтоуправление "Донбасс"

Государственное открытое акционерное общество "Шахтоуправление Донбасс"

Активная 5 682 309 кВт·ч 1 456 347.17 грн. НДС грн. 291 269.43 Всего грн. 1 747 616.6

в.т.ч.	кВт·ч	Г	К	№	Тариф	Сумма	прим.
15 Пром.потреб.свыше 750кВА гр.1	1293071	1	1	2	0,2563	331 414.10	оп 1
15 Пром.потреб.свыше 750кВА гр.1	-1579066	1	1	2	0,2563	-404 714.62	оп 2
15 Пром.потреб.свыше 750кВА гр.1	5967767	1	1	2	0,2563	1 529 538.68	
15 Общежитие(общ.учет) гр.9	537	8	2	7	0,203	109.01	

Всего по Счету(без НДС) грн. 1 456 347.17 НДС 291 269.43 Всего грн. 1 747 616.60

Дебиторская задолженность на 01.06.2007 Сумма(без НДС) НДС Сумма(всего)

Итого к оплате Активная энергия 1 452 912.08 290 582.33 1 743 494.41

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Расчетчик ИВЧЕНКО С.П.

Figure 7: Electricity billing from May 2007. There a three tariffs for day, afternoon and night consumption. Prices in Hrivna (UAH). The mean value is 0.2563 UAH/kWh