CONSTRUCTION OF THE REPLACEMENT
600 MW UNIT 6 IN ŠOŠTANJ TPP

AMENDED INVESTMENT PLAN

Rev. 4

18 August 2011

Study type: Amended investment plan

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Termoelektrarna Šoštanj d.o.o.
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The Supervisory Board of TEŠ d.o.o. reviewed the Ammended investment program, revision 4 at its 59th meeting held on 18 August 2011, and adopted the following conclusions:

CONCLUSION:
Based on examination of the revised investment program "Construction of susbstitute Unit 6 600 MW in TEŠ", revision 4, presentation of the management and producers of the revised investment program, studying of the review of the revised investment program and presentation of the reviewer, and also based on the conclusions of an expert committee that was appointed by the Director of the company, the Supervisory Board establishes that the amended investment program Revision 4 is prepared in accordance with the prescribed methodology (Regulation on a uniform methodology for the preparation of investment documentation in the fields of public finance, Official Gazette . 6 / 06, 54/10) and in accordance with observations and recommendations arising from decisions taken at the 130th regular meeting of the Government of Republic of Slovenia, held on 14 April 2011.

CONCLUSION:
Supervisory Board gives approval to the revised investment program "Construction of susbstitute Unit 6 600 MW in TEŠ", 4th revision

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1. INTRODUCTION

The electricity market is becoming more and more complex, both in terms of providers, temporal dynamics of consumption, and protection of the environment, as well as due to the goal of ensuring sustainable growth of the energy sector and the overall economy, national and global. Due to accelerated investments and subsidizing renewable energy sources, the demand for reliable production systems enabling the stability of the electric power system has also increased. Following contemporary energy sector policies was crucial in devising the replacement Unit 6 for Termoelektrarna Šoštanj d.o.o. (Unit 6 ŠTPP).

The main reason for the new replacement Unit 6 ŠTPP is that the existing production units in the Šoštanj thermal power plant (ŠTPP) are obsolete and operating with outdated technology which will eventually fail to comply with the minimum requirements for such units. The energy location with complete electricity output infrastructure as well as the support of the residents is crucial in the assessment of investment viability. It is currently impossible to acquire a new energy location in a relatively short period of time (five years), not only in Slovenia, but also abroad.

ŠTPP currently provides approximately 1/3 of the electricity production in the Republic of Slovenia and its role is almost irreplaceable due to the specificity of its operation, which adapts to the requirements of the electric power system and the consumers. The existing coal-fired units have 695 MW of power, which is a little over 15% more than the replacement Unit 6.

By constructing the new coal-fired replacement unit (Unit 6) with the newest (BAT) technology, the impact on the environment with emissions of greenhouse gas CO_2 and other emissions will be significantly reduced, while a substantially higher energy efficiency of the new unit will be achieved at the same time.

The key objectives of the investment are:
1. Maintaining the electricity production in ŠTPP by using domestic coal,
2. Electricity production of ca. 3,500 GWh with a ca. 30 % lower consumption of coal[1],
3. Decreasing the emission factor (kg CO2 / kWh) from 1.25 to 0.87,
4. Decreasing the cost price of electricity by more than 20 EUR/MWh,
5. Achieving a return on equity of at least 10 %,
6. Ensuring the continued existence of the energy sector in Šaleška Valley in collaboration with Premogovnik Velenje coal mine,
7. Fulfilling the EU climate commitments,
8. Achieving an internal rate of return (IRR) of over 7 %.

AIP 4 also includes all demands and proposals arising from memorandums and resolutions of the Ministry of the Economy of the Republic of Slovenia and the Government of the Republic of Slovenia. Resolutions of the 130th regular session of the Government of the RS on 14 April 2011 were particularly taken into account. Among other things, the Government adopted the following resolution under section III.-8A:
Given the project's high degree of risk and considering the high level of exposure of the State as the owner of HSE in regard to the project of constructing Unit 6 ŠTPP, the Government of the Republic of Slovenia is prepared to assume additional risk by issuing a state guarantee for the Unit 6 ŠTPP project in the amount of 400 million EUR, provided that the investor's new investment programme which will take into account all expenses related to the project (including the expenses of decommissioning Units 4, 5 and 6 and the gas turbines after the end of their service life), with a thorough analysis of the

[1] The reduction is foreseen in accordance with the weighted average efficiency of existing ŠTPP production units (Unit 3, 4 and 5), which is between 32.5 and 33.0 %. Compared to Unit 6, which has a maximum efficiency of 43 %, this represents a ca. 30 % reduction.

capability of achieving the coal price of 2.25 EUR/GJ as well as a thorough analysis of all other input parameters of the investment, will prove that all the conditions for achieving profitability of the project, which should be specified by sectoral policy in the field of energy, are met.

In accordance with the Decree on the uniform methodology for the preparation and treatment of investment documentation in the field of public finance, the amendment of the investment programme is not required, as the investment is already underway and its price did not increase by more than 20 % as prescribed by Article 6 of the Decree. The amendment of the investment programme has been prepared for the following reasons:
- Realistic cost assessment for the contract for supplying the main technological equipment,
- Changes in the value of the construction works,
- Changes in the range of equipment by packages,
- Changes in the financing conditions and consequentially in the costs of funding,
- Inclusion of the expenses of decommissioning all units in the project economics,
- A more detailed definition of all coal parameters, and at the request of the Government.

While AIP 4 was being prepared, the draft of the National Energy Programme (NEP draft), which will outline the development of Slovenia's energy sector until 2040, was published and publically presented. The NEP draft also includes the replacement Unit 6 ŠTPP project. The analytical section of the NEP draft also provides the prices of electricity and CO_2 emission credits in future periods of time. In order to avoid a discussion on the correctness of the prices, we have included the predicted prices from the NEP draft into the calculation of the economic viability of the investment in Unit 6.

1.1 SUMMARY OF THE PREPARED INVESTMENT DOCUMENTATION

The Pre-investment concept from July 2005, which followed the Identification document for the investment project from May 2005, is considered the beginning of the production of the investment documentation in accordance with the Decree on the uniform methodology for the preparation and treatment of investment documentation in the field of public finance (Official Gazette of the RS 60/2006) and changes and amendments published in the Official Gazette of the RS 54/2010. Based on these documents and studies, the Investment programme, April 2006, was prepared. In November 2006, the 1st revision was elaborated. In March 2009, the production of the Amended investment programme Rev. 2 was concluded, and it was followed by Rev. 3 in October 2009 at the request of the owner. Revision 3 was revised by the company CEE d.o.o.

Based on studies, comments by the Government of the Republic of Slovenia, the Ministry of the Economy and the Capital Assets Management Agency of the Republic of Slovenia, and especially due to the requests of the Supervisory boards of TEŠ d.o.o. and HSE d.o.o., Revision 4 has been prepared in accordance with the above-quoted Decree, Article 6.

This section shows the summaries of the underlying investment programme, including all revisions. Special attention was given to the summary of Revision 4, which also closely shows the differences of the estimated value of individual items compared to Revision 3. The inclusion of the realistic assessment of the contract escalation into the estimated value at current prices in Revision 4 is the most important element.

1.1.1 SUMMARY OF THE PRE-INVESTMENT CONCEPT

The **pre-investment concept** (July 2005) deals with the comparison of 500 MW and 600 MW units, which are available and tested on the market with parameters of the process which enable high efficiency, consequential low specific CO_2 emissions and an appropriate sales price of electricity.

The unit uses coal from the Premogovnik Velenje coal mine as fuel. According to Velenje coal mine information about planned purchases, the heating of the 600 MW variant was foreseen as a mixture of lignite and imported black coal, in order to harmonize the electric energy production from the new unit with the available coal. The black coal percentage changes depending on the available quantities of lignite, but never exceeds 6 % of the total quantity of coal (by weight). With the 500 MW variant, only the use of Velenje lignite is predicted.

The investment economics for a 40-year operation period with the electricity sales price at 10.5 SIT/kWh (43.75 EUR/MWh) and the price of Velenje lignite at 26.2 EUR/ton and 22.9 EUR/ton were calculated for both units (500 and 600 MW).

The investment economic indicators are as follows:

		500 MW	*600 MW*
Coal price 26.2 EUR/t			
-cost price of electricity:	SIT/kWh	8.57	8.45
-investment repayment period:	years	25	24
-net present value (6 % discount rate):	million SIT	-11,556	-4,058
-internal rate of return:	%	5.2	5.7
Coal price 22.9 EUR/t			
-cost price of electricity:	SIT/kWh	7.79	7.84
-investment repayment period:	years	22	21
-net present value (6 % discount rate):	million SIT	11,412	17,813
-internal rate of return:	%	6.8	7.1

1.1.2 SUMMARY OF THE INVESTMENT PROGRAMME

The investment programme (April 2006) dealt with the construction of a unit with pulverized coal combustion (PCC) technology with supercritical steam parameters (270 bar, 600/610 °C) in the so-called BoA (Betriebsoptimierte Anlagen) technology and 600 MW of power on the generator terminals.

1.1.2.1. ESTIMATED VALUE OF THE INVESTMENT

	Constant prices	*Current prices*	*Increase*
	000 EUR	*000 EUR*	*%*
Construction work	**92,292.9**	**100,320.0**	**8.70 %**
Preparatory work	9,176.7	9,756.7	6.32 %
Cooling tower	16,224,2	17,647.5	8.77 %
MPF	44,380,4	48,323.3	8.88 %
Flue gas cleaning	7,514,2	8,153.3	8.51 %
Smokestack	7,250,0	7,932.9	9.42 %
Auxiliary facilities	5,900,4	6,452.9	9.36 %
Finalization works	1,847,1	2,052.9	11.14 %
Mechanical and technological equipment	**401,222,9**	**435,280.8**	**8.49 %**
Boiler with auxiliary equipment	195,577,1	211,965.0	8.38 %
Turbo generator with aux. equip.	97,850,0	106,049.2	8.38 %
Flue gas cleaning	95,500,0	103,753.8	8.64 %
Water treatment	3,050,0	3,342.5	9.59 %
Coal transport	3,764,2	4,144.2	10.10 %
Product processing	3,732,1	4,108.8	10.09 %
Waste water treatment plant	1,750,0	1,917.9	9.60 %
Electrical equipment	**43,400,0**	**46,960.0**	**8.20 %**

Energy equipment	29,700,0	32,141.3	8.22 %
Control system	13,700,0	14,818.8	8.17 %
Other	**61,740,0**	**66,606.3**	**7.88 %**
Investor expenses	19,500,0	20,936.7	7.37 %
Supplier engineering	42,240,0	45,669.6	8.12 %
Total	**598,655,8**	**649,167.1**	**8.44 %**
Financing expenses	**38,305.0**	**42,210.0**	**10.19 %**
Estimated value	**636,960.0**	**691,377.1**	**8.54 %**

The investment economics for the unit were calculated for a 40-year operation period with the electric energy sales price at 43.75 EUR/MWh and the price of Velenje lignite at 23.18 EUR/ton or 2.25 EUR/GJ. The investment economic indicators are as follows:

Average cost price of electric power	34.25 EUR/MWh
Investment repayment period	16 years
Net present value with a 6 % discount rate	88.97 million EUR
Internal rate of return	7.5 %
Relative net present value	0.19

1.1.3 SUMMARY OF THE AMENDED INVESTMENT PROGRAMME (REV. 1)

In November 2006, the investor published a Periodic indicative notice for selecting competent tenderers for supplying the main technological equipment for the 600 MW Unit 6. Based on the applications received, the contracting authority acknowledged the capability of candidates Alstom Power Centrales and Siemens AG in consortium with Hitachi Power Europe and Siemens Ljubljana. In April 2007, the contracting authority sent the tender documentation for supplying and installing the main technological equipment to both candidates. The contract giver evaluated both bids, Alstom's was deemed appropriate and was used as a basis for the elaboration of the Amended IP (rev. 1, September 2007).
The investor decided to amend the investment programme mainly because of:
- Changes in the time schedule of the works
- Increase of the estimated value of the project
- Changes in the structure and terms of financing

The market situation for high complexity energy-related equipment, which is planned for Unit 6, has changed significantly. The possible completion date for the facility would not be before November 2014, provided that the investor enters into a contract for the delivery. The time schedule in the amended investment programme (rev. 1) was corrected in accordance with these facts.
The economic prospects on the market caused the growth of steel and steel product prices, especially high complexity energy-related equipment, due to the small number of qualified contractors. Between December 2005 (basis for the prices in the IP) and July 2007, which was the basis for the amended IP, the specific price of such equipment increased from ca. 950 EUR/kW to ca. 1,450 EUR/kW. The increased amount of loans and an increase of the interest rates caused an increase of the costs of funding, so that the estimated value of the project at constant prices changed from 637.0 million EUR to 953.9 million EUR.
The investment economics for the unit were calculated for a 40-year operation period with the electric energy sales price at 70 EUR/MWh and the price of Velenje lignite at 2.25 EUR/GJ.

1.1.3.1. ESTIMATED VALUE OF THE INVESTMENT

	Constant Prices	*%*	*Current Prices*	*Increase*

	000 EUR		*000 EUR*	*%*
1. Construction work	**93,575.5**	**9.8 %**	**105,315.3**	**12.5 %**
Preparatory work	10,094.2	1.1 %	10,560.5	4.6 %
MPF construction work	48,818.6	5.1 %	54,969.9	12.6 %
Cooling tower	9,900.0	1.0 %	11,188.1	13.0 %
Other construction work	24,762.8	2.6 %	28,596.7	15.5 %
2. Equipment and installation	**775,800.0**	**81.3 %**	**870,681.2**	**12.2 %**
MTE	654,000.0	68.6 %	731,636.5	11.9 %
FGD	99,159.6	10.4 %	113,414.0	14.4 %
Water preparation and treatment	5,520.0	0.6 %	6,394.2	15.8 %
Coal transport	4,328.6	0.5 %	5,014.1	15.8 %
Product processing	4,291.8	0.4 %	4,971.5	15.8 %
GIS 400 kV	8,500.0	0.9 %	9,250.8	8.8 %
3. Other	**84,544.6**	**8.9 %**	**94,662.6**	**12.0 %**
Investor expenses	20,670.0	2.2 %	22,676.3	9.7 %
Financing expenses	63,874.6	6.7 %	71,986.3	12.7 %
TOTAL	**953,920.1**	**100 %**	**1,070,659.2**	**12.2 %**

The investment economic indicators are as follows:

Average cost price of electric power	39.6 EUR/MWh
Investment repayment period	14.7 years
Net present value with a 6 % discount rate	502.3 million EUR
IRR	11.1 %
RNPV	0.79

1.1.4 SUMMARY OF THE AMENDED INVESTMENT PROGRAMME (REV. 2)

The **amended investment programme** (revision 2, March 2009) dealt with the construction of a unit with pulverized coal combustion (PCC) technology with supercritical steam parameters (270 bar, 600/610 °C) in the so-called BoA (Betriebsoptimierte Anlagen) technology and 600 MW power on the generator terminals.

The reasons for the amendment were as follows:
- Increase of the main technological equipment price
- A shift of the time limit for the works and for completion
- Changes of the value of the construction works
- Changes in the range of equipment by packages
- Changes in the financing conditions and consequentially in the financing costs

The investment economics for the unit were calculated for a 40-year operation period with the electric energy sales price at 70 EUR/MWh and the price of Velenje lignite at 2.25 EUR/GJ.

1.1.4.1 ESTIMATED VALUE OF THE INVESTMENT

	Constant Prices	*%*	*Current Prices*	
	000 EUR		*000 EUR*	*Increase*

Construction work	**96,896.2**	**7.2 %**	**102,923.6**	**6.2 %**
Preparatory work	11,700.0	0.9 %	11,830.5	1.1 %
MPF	54,207.2	4.0 %	58,073.8	7.1 %
Cooling tower	13,194.0	1.0 %	13,841.9	4.9 %
Other structures	17,795.0	1.3 %	19,177.4	7.8 %
Equipment	**1,010,062.3**	**75.2 %**	**1,072,793.0**	**6.2 %**
MTE	878,592.0	65.4 %	931,689.5	6.0 %
FGD	97,176.4	7.2 %	104,147.2	7.2 %
Water preparation	5,796.0	0.4 %	6,336.5	9.3 %
Coal transport	4,545.0	0.3 %	4,903.5	7.9 %
Product processing	4,506.4	0.3 %	4,917.1	9.1 %
Cooling system	11,446.5	0.9 %	12,476.7	9.0 %
GIS 400 kV	8,000.0	0.6 %	8,322.6	4.0 %
Other	**22,116.9**	**1.6 %**	**23,214.6**	**1.6 %**
Investor expenses	22,116.9	1.6 %	23,214.6	5.0 %
Total	**1,129,075.5**	**84.1 %**	**1,198,931.3**	**84.2 %**
Financing expenses	213,662.7	15.9 %	225,624.2	5.6 %
TOTAL	**1,342,738.2**	**100 %**	**1,424,555.4**	**6.1 %**

The investment economic indicators are as follows:

Average cost price of electric power	41.7 EUR/MWh
Investment repayment period	16 years
Net present value with a 7 % discount rate	237.8 million EUR
Internal rate of return	9.11 %
Relative net present value	0.29

1.1.5 SUMMARY OF THE AMENDED INVESTMENT PROGRAMME (REV. 3)

The **amended investment programme** (revision 3, October 2009) dealt with the construction of a unit with pulverized coal combustion (PCC) technology with supercritical steam parameters (270 bar, 600/610 °C) in the so-called BoA (Betriebsoptimierte Anlagen) technology and 600 MW power on the generator terminals.

The reasons for the amendment were as follows:

- Changes of the investment value:
  - Decrease of the contract value of the main technological equipment for Unit 6
  - Decrease of the value of the flue gas desulphurisation equipment for Unit 6
  - Changes in the method of electricity evacuation
- Increase of the estimated sales price of electricity from 70 EUR/MWh to 71.5 EUR/MWh.
  Inclusion of the total cost of emission credits for CO_2 emissions after 2012.
- Shortening of the construction time from 63 months to 60 months.
- Changes in the financing costs during the construction based on the changed positions in respect of the structure and dynamics of the finance resources.

The investment economics for the unit were calculated for a 40-year operation period with the electric energy sales price at 71.5 EUR/MWh and the price of Velenje lignite at 2.25 EUR/GJ.

1.1.5.1 ESTIMATED VALUE OF THE INVESTMENT

	Constant Prices		*Current Prices*	
	000 EUR	*%*	*000 EUR*	*Change*
Construction work	**78,857.2**	**7.14 %**	**83,697.3**	**6.14 %**
Preparatory work	6,852.0	0.62 %	6,865.8	0.20 %
MPF	48,137.2	4.36 %	51,491.1	6.97 %
Cooling tower	11,304.0	1.02 %	11,811.1	4.49 %
Other structures	12,564.0	1.14 %	13,529.4	7.68 %
Equipment	**908,240.9**	**82.28 %**	**963,950.2**	**6.13 %**
MTE	694,973.0	62.96 %	737,330.3	6.09 %
MTE installation	89,000.0	8.06 %	95,489.9	7.29 %
Preliminary works	25,000.0	2.26 %	24,586.6	-1.65 %
FGD	75,970.0	6.88 %	81,176.4	6.85 %
Water preparation	4,832.0	0.44 %	5,281.0	9.29 %
Coal transport	3,483.0	0.32 %	3,755.8	7.83 %
Product processing	3,536.4	0.32 %	3,857.5	9.08 %
Cooling system	11,446.5	1.04 %	12,472.8	8.97 %
Other	**10,116.9**	**0.92 %**	**10,410.6**	**2.90 %**
Investor expenses	10,116.9	0.92 %	10,410.6	2.90 %
Total	**997,215.0**	**90.34 %**	**1,058,058.2**	**6.10 %**
Financing expenses	106,579.8	9.66 %	111,782.3	4.88 %
TOTAL	**1,103,794.8**	**100.00 %**	**1,169,840.5**	**5.98 %**

The investment economic indicators are as follows:

Average sales price of electricity	71.5 EUR/MWh
Average cost price of electricity	55.83EUR/MWh
Investment repayment period	17 years
NPV with a 7 % discount rate	17.0 million EUR
IRR	7.17 %
RNPV	0.022
Relative benefit indicator	1.008

Due to changes in financing sources, Annex 1 to AIP, rev. 3, was prepared in November 2009, taking into account the following changes:

1.1.5.2 ESTIMATED VALUE OF THE INVESTMENT ANNEX 1 TO AIP, REV. 3

	Constant Prices		*Current Prices*	
	000 EUR	*%*	*000 EUR*	*Change*
Construction work	**78,857.2**	**7.03 %**	**83,697.3**	**6.14 %**
Preparatory work	6,852.0	0.61 %	6,865.8	0.20 %
MPF	48,137.2	4.29 %	51,491.1	6.97 %
Cooling tower	11,304.0	1.01 %	11,811.1	4.49 %
Other structures	12,564.0	1.12 %	13,529.4	7.68 %
Equipment	**908,240.9**	**80.99 %**	**963,950.2**	**6.13 %**

MTE	694,973.0	61.97 %	737,330.3	6.09 %
MTE installation	89,000.0	7.94 %	95,489.9	7.29 %
Preliminary works	25,000.0	2.23 %	24,586.6	-1.65 %
FGD	75,970.0	6.77 %	81,176.4	6.85 %
Water preparation	4,832.0	0.43 %	5,281.0	9.29 %
Coal transport	3,483.0	0.31 %	3,755.8	7.83 %
Product processing	3,536.4	0.32 %	3,857.5	9.08 %
Cooling system	11,446.5	1.02 %	12,472.8	8.97 %
Other	**10,116.9**	**0.90 %**	**10,410.6**	**2.90 %**
Investor expenses	10,116.9	0.90 %	10,410.6	2.90 %
Total	**997,215.0**	**88.93 %**	**1,058,058.2**	**6.10 %**
Financing expenses	124,185.7	11.07 %	131,058.9	5.53 %
TOTAL	**1,121,400.6**	**100.00 %**	**1,189,117.1**	**6.04 %**

1.2 SUMMARY OF THE KEY ELEMENTS OF THE AMENDED INVESTMENT PROGRAMME, REVISION 4

1.2.1 REASONS FOR THE AMENDED INVESTMENT PROGRAMME

In addition to the reasons for the elaboration of AIP 4 given in the previous section, reasons for the amendment also include:
- Realistic cost assessment for the contract for supplying the main technological equipment
- Changes in the value of the construction works
- Changes in the range of equipment by packages
- Changes in the financing conditions and consequentially in the costs of funding
- Inclusion of the expenses of decommissioning all units in the project economics
- A more detailed definition of all coal parameters

Individual positions are explained in detail in section 1.2.4

The amended investment programme “Construction of the replacement 600 MW Unit 6 in Šoštanj Thermal Power Plant” has been elaborated in accordance with the “Decree on the uniform methodology for the preparation and treatment of investment documentation in the field of public finance” (Official Gazette RS, No. 60/2006), taking into account the specific infrastructural character of the investment. Šoštanj Thermal Power Plant is obliged to produce the investment programme in accordance with Article 3 of this methodology, which prescribes the obligatory use of this methodology in cases when a state guarantee is required for ensuring financing sources for the investment (part of the EIB loan). Considering that the EIB loan in the amount of 440 million EUR will require a state guarantee, the use of this methodology is necessary.

All calculations within the investment programme are based on the data from the existing documentation, equipment manufacturers’ data and data acquired from competent departments of Termoelektrarna Šoštanj (ŠTPP) and Holding Slovenske elektrarne (HSE).

The economic calculations also take into account the Guidance on the Methodology for carrying out Cost-Benefit Analysis, prepared by the European Commission. In the “Guidance on the Methodology for carrying out Cost-Benefit Analysis” (http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf), the European Commission suggests a 5.5 % discount factor for investments with strong synergistic effects, which undoubtedly holds true for the content of the Unit 6 project. However, this discount factor is only used for investments in countries where the level of development does not achieve 90 % of the average GDP per capita in the European Union, i.e. less developed European countries. A 3.5 % discount factor is proposed for countries which achieve the above-mentioned average, therefore a 5.5 % discount factor is proposed for Slovenia and other countries which do not yet achieve this factor. Considering the fact that Slovenia's GDP is very close to the threshold, the use of the lower discount factor (3.5 %) is entirely reasonable. It is an uncontested fact that the owner (RS) enjoys all other benefits associated with the synergistic effects of the project (income tax, revenue from the CO_2 tax, revenue from social transfers …). All the mentioned and other positive effects were taken into account by the European Commission when determining the discount factors, and as a result the neutral factor for the country was set at 3.5 % or 5.5 %.

The financial and economic calculations of both methodologies are given below.

1.2.2 COMPARISON OF THE ESTIMATED VALUE (constant prices)

	AIP rev. 4 (August 2011)	*Annex 1 to AIP rev. 3 (October 2009)*	*Change*
	000 EUR	*000 EUR*	*000 EUR*
Construction work	**74,868.2**	**67,553.2**	**7,315.0**
Preparatory work	20,485.7	6,852.0	13,633.7
MPF	34,663.3	48,137.2	-13,473.9
Other structures	10,680.7	12,564.0	-1,883.3
Administration building	8,507.6	0.0	8,507.6
Other	530.9	0.0	530.9
Equipment	**964,273.6**	**919,544.9**	**44,728.7**
MTE	699,156.3	694,973.0	4,183.3
MTE escalation	9,372.6	0.0	9,372.6
MTE installation	97,205.9	89,000.0	8,205.9
Reservation contract	25,000.0	25,000.0	0.0
FGD	78,553.0	75,970.0	2,583.0
Water treatment	7,515.9	4,832.0	2,683.9
Coal transport	4,986.9	3,483.0	1,503.9
Product processing	13,000.1	3,536.4	9,463.7
Cooling system	23,338.1	22,750.5	587.6
Technological links	1,989.4	0.0	1,989.4
Connection to the electricity system of RS	3,446.7	0.0	3,446.7
Other	708.8	0.0	708.8
Other	**34,107.5**	**10,116.9**	**23,990.6**
Investor expenses	27,563.2	10,116.9	17,446.3
Insurance	6,544.3	0.0	6,544.3
Total	**1,073,249.4**	**997,215.0**	**76,034.4**
Financing expenses	122,678.7	124,185.7	-1,507.0
TOTAL	**1,195,928.1**	**1,121,400.7**	**74,527.4**

Of that:

HSE guarantee expenses (000 EUR)	**6,166.6**	**0.0**

Annex 1 rev. 3 = Annex 1 to Amended IP October 2009 *rev. 4 = Amended IP August 2011*

1.2.3 COMPARISON OF THE ESTIMATED VALUE (current prices)

	AIP rev. 4 (August 2011)	*Annex 1 to AIP rev. 3 (October 2009)*	*Change*
	000 EUR	*000 EUR*	*000 EUR*
Construction work	**75,969.3**	**71,886.3**	**4,083.0**
Preparatory work	20,569.7	6,865.8	13,703.9
MPF	35,342.0	51,491.1	-16,149.1
Other structures	11,000.0	13,529.4	-2,529.4
Administration building	8,507.6	0.0	8,507.6
Other	550.0	0.0	550.0
Equipment	**1,063,120.7**	**975,761.4**	**87,359.3**
MTE	699,434.0	694,973.0	4,461.0
MTE escalation	100,056.5	42,357.3	57,699.2
MTE installation	100,000.0	95,489.9	4,510.1
Reservation contract	25,000.0	24,586.6	413.4
FGD	82,053.0	81,176.4	876.6
Water treatment	7,700.0	5,281.0	2,419.0
Coal transport	5,100.0	3,755.8	1,344.2
Product processing	13,500.0	3,857.5	9,642.5
Cooling system	24,047.2	24,283.9	-236.7
Technological links	2,000.0	0.0	2,000.0
Connection to the electricity system of RS	3,500.0	0.0	3,500.0
Other	730.0	0.0	730.0
Other	**35,106.9**	**10,410.6**	**24,696.3**
Investor expenses	28,337.8	10,410.6	17,927.2
Insurance	6,769.1	0.0	6,769.1
Total	**1,174,196.9**	**1,058,058.3**	**116,138.6**
Financing expenses	128,550.2	131,058.9	-2,508.7
TOTAL	**1,302,747.0**	**1,189,117.2**	**113,629.8**

Of that:

HSE guarantee expenses (000 EUR)	**6,540.8**	**0.0**

Annex 1 rev. 3 = Annex 1 to Amended IP October 2009
rev. 4 = Amended IP August 2011

1.2.4 EXPLANATION OF DICREPANCIES BETWEEN ANNEX 1 TO AMENDED INVESTMENT PROGRAMME (AIP 3), OCTOBER 2009, AND AIP 4, AUGUST 2011

Most of the investment increases were already known throughout the execution of the investment. Until now, these expenses were mostly expensed within the company's annual plans, but they are now shown as part of the investment, as it is usually the case with this kind of investments.

1.2.4.1 CONSTRUCTION WORKS

1.2.4.1.1 Preparatory works

The 13,703,900 EUR increase is based on the fact that the preliminary assessment did not include the following expenses:

- Restoration of transport infrastructure for special freight transportation – in accordance with the contract signed with Alstom on 27 June 2008, ŠTPP is obliged to prepare (rail or road) infrastructure which will enable special freight transport (generator stator and energy transformer). Due to the large dimensions and weight, the transport route will need to be restored, reinforced and additionally supported and corrected before and during the transport. The estimated cost of the restoration is 6,000,000 EUR.
- Installation plateaus – AIP 3 did not cover them, but the investor is obliged to provide them in accordance with the contract with Alstom. The value of the package is estimated at 1,253,000 EUR.
- Additional parking spaces next to the TUŠ market and next to the railway were not included in AIP 3 and are estimated at 400,000 EUR.
- Roundabout – entry point from the main road to the construction site – was not predicted in AIP 3, but it is essential for carrying out transport to the construction site and easier manipulation of a large number of special freight transports, as this will mitigate traffic difficulties during construction. The estimated cost is 500,000 EUR.
- Demolition of houses on Aškerčeva Street, which need to be removed in order to prepare the space for the construction plateaus. The estimated cost is 70,000 EUR.
- Overall construction site preparation – a certain organisation of the construction site is predicted within the construction permit, it should be prepared by the contracting authority and made available to the contractor. This includes arranging the plateaus, construction site fencing, wiring and plumbing, and road accessibility. The estimated value is 4,500,000 EUR.
- Additional work is required on the hillside: due to the specificity of the soil, additional hill planning works have been required. The expense of the additional works is estimated at 980,900 EUR.

Projected increase: 13,703,900 EUR

1.2.4.1.2 Main Power Facility

An expense reduction in the amount of 16,149,100 EUR is based on the fact that the prices of construction work have decreased by ca. 30 % due to the recent world economic crisis.

A tender is still required for the cranes and the construction equipment, which is estimated at 5,342,000 EUR and has already been taken into account in the estimate of the overall value of the main power facility package (35,342,000 EUR). The remaining difference between the 24,560,291 EUR contract with the chosen contractor and the estimate is intended for covering the costs resulting from the fact that the tender is based on the inventory in the project for acquiring the construction permit (PGD). The documentation for the project for execution (PZI) is being prepared in collaboration with Alstom and, as expected, changes which will influence the amendment and changes to the PGD inventory are occurring. Before the PGD projects were prepared, an insufficient number of geological bores was made for predicting the excavation technology needed. Since the excavation works are already underway, we have established, in collaboration with the geomechanic, that significant changes will occur in the protection of the excavation sites, especially in the area of the cooling tower of Unit 4, where there is a danger of subsidence due to the extraction of water. We have also found that the excavations will include 5th category excavations which were not predicted in the PGD. It was also impossible to predict how many tons of steel anchors would need to be installed.

Projected decrease: 16,149,100 EUR

1.2.4.1.3 New Administration Building

The investment value includes the value of a new administration building, which has been built because the old administration building needed to be demolished, as it stood on the site where the new Unit 6 is planned. AIP 3 did not include this investment and the actual value of the investment is 8,507,597 EUR.

Projected increase: 8,507,957 EUR

1.2.4.1.4 Other structures
Due to the world economic crisis, the cost of construction work recently decreased by ca. 30 %, which is also confirmed by the price in the contract for the construction of the main power facility. For that reason the value of the package has been reasonably reduced.

Projected decrease: 2,529,400 EUR

1.2.4.1.5. Other
AIP 3 did not take into account:
- External quality supervision of materials used – estimated at 250,000 EUR
- Land surveying supervision – estimated at 200,000 EUR
- Geomechanic supervision – estimated at 100,000 EUR

External supervisions are essential for this type of demanding structures, as quality of the materials used in the construction of the unit (concrete and concrete reinforcement) needs to be ensured. It is also necessary to provide suitable land surveying control, as the handing over between the builders and the equipment manufacturers will be taking place in key positions, which have to be geodetically coordinated. These expenses are not covered within the investor's expenses.

Projected increase: 550,000 EUR

1.2.4.2 MAIN TECHNOLOGICAL EQUIPMENT

1.2.4.2.1 CHANGES TO THE MTE CONTRACT
The 4,461,000 EUR increase results from the fact that the preliminary assessment did not include the following items:
- Changed type of the high-pressure boiler. In the context of optimising the equipment and prices for the supply of the boiler equipment, we have decided to replace the vertical collector-type high-pressure preheaters with horizontal preheaters with a tubular plate, which is an older design, but the replacement does not influence the boiler operating conditions. We have achieved savings in the amount of 1,039,000 EUR by making the replacement.
- Change caused by improving the technology due to the requirements of the Environmental permit (OVD). The contracting authority, Temoelektrarna Šoštanj d.o.o., issued an invitation to tender for supplying the Main technological equipment for Unit 6 on 7 October 2006. After the completion of the negotiations, the contract was signed on 27 June 2008. According to the Contract for the supply of the main technological equipment for Unit 6, the supplier is obliged to supply a DeNOx device with two planes of catalysts and one backup plane. During the time when the contract was signed and before the Environmental permit was received, provisions from decrees (Decree on the emission of substances into the atmosphere from stationary sources of pollution, Decree on the emission of substances into the atmosphere from large combustion plants) were in force which allowed emission into the atmosphere from stationary sources and large combustion plants up to 200 mg/Nm^3 NO_x (dry, 6 % O_2), which is also the contractual warranty value. Termoelektrarna Šoštanj d.o.o. received an Environmental permit (OVD) from the Ministry of the Environment on 16 February 2011 with the permissible value of nitrogen oxides emission into the atmosphere from the VKN6 combustion plant (boiler – N54) at 150 mg/Nm^3 (dry, 6 % O_2). To meet this demand, the backup plain needs to be retrofitted with catalyst modules, additional nozzles provided and the capacity of the unit's evaporator and pumps must be checked, as well as the ones on the ammonia water storage facility. The estimated cost of the environmental demands is 2,500,000 EUR.
- Acquisition of spare parts. Acquisition of spare parts within the underlying contract has several advantages which should be used if the opportunity arises. The factors in favour of acquiring spare

parts within the underlying contract can be divided into three groups: continuous process of start-up tests, maintenance during the warranty period, economic factors.

The factors from the first group are especially important due to the fact that they ensure a selection of critical spare parts during the entire period of start-up testing, which allows for an undisturbed course of start-up testing activities and consequentially the completion of the project within the set time and financial framework. Usually the main equipment supplier uses the spare parts from the critical set and then replaces them with new ones, especially when it comes to parts with a longer delivery period.

During operation within the warranty period and after the warranty period has run out, it is crucial that spare parts (especially ones with a longer delivery period) and non-standard machine parts which can only be acquired from the supplier are available in case of potential problems or shutdowns. Guaranteed spare parts are the only thing that ensures immediate restoration and rectification of potential problems with the shortest possible loss of production. Special attention must be given to the material for the pressurised section of the boiler, as the delivery period for some types of steel (Super 304H, 7CrMoVTiB1010, VM12 SHC, HR3C) is relatively long. Due to thermal and mechanical loads, these steels cannot be replaced with other materials.

It is a common practice in concluding contracts that the scope of the supply also includes certain spare parts which the supplier considers to be necessary for at least 2 years of operation.

Spare parts can be divided into various groups: parts that need replacing due to wear, strategic spare parts and recommended spare parts – parts for which the supplier foresees the option of use within the warranty period. The advantages of including spare parts into the basic contract primarily include the lower price due to the spare parts being part of the equipment quota, and guaranteed quality as the spare parts are original.

Taking into account the above, we believe that acquiring spare parts within the main contract is justified and will contribute to a better realization of the project within the set time and financial framework, as well as to better and faster maintenance after the end of the warranty period and the consequential shorter time of potential production loss due to the elimination of potential failures. The estimated cost of the acquisition of spare parts is 3,000,000 EUR.

Projected increase: 4,461,000 EUR

1.2.4.2.2 ESCALATION FORMULA

The Contract for the supply of the main technological equipment, signed on 27 June 2008, determined an escalation formula which allows an amendment of the contract price if the pricing factors of the formula change. Instead of determining the escalation addition on the contract price based on this formula, NIP 3 accounted for an addition estimated in accordance with projections of inflation expectations, which amounted to 42,357,300 EUR. In accordance with the realistic movement of contract indices, estimates related to the escalation level grew substantially. Due to the contents of the escalation formula being significantly to the supplier's benefit, the owner of ŠTPP initiated additional negotiations on limiting this formula. An agreement signed in January 2011 is the result of the negotiation. It determines that 18.5 % of the contract price is fixed, taken out of the escalation calculation, and will no longer escalate. The investor initiated additional negotiations with the supplier, which have achieved that a cap on the escalation will be determined. The resulting cap will not exceed 100,056,500 EUR. Despite the investor's efforts to limit the negative impact of the escalation, the addition to the already projected addition to the investment value still amounts to 57,699,200 EUR. The savings resulting from the negotiations on the content of the escalation formula are estimated at ca. 35,000,000 EUR. The investor estimates that without the negotiations on the content of the negotiation formula, the final amount would reach ca. 135,000,000 EUR.

Projected increase: 57,699,200 EUR

1.2.4.2.3 INSTALLATION

The estimated value of the installation works for the main technological equipment is based on the document entitled "Erection Cost Definition" and on the Alstom Corporation's data on the required number of installers, given after a month-long involvement in comparable projects. The monthly dynamics show that approximately 3,150,000 man-hours will be required for the installation of the main technological equipment. With the average price of the installers at 18 EUR per man-hour, which was taken into account in AIP 3, the labour costs amount to 56,700,000 EUR. The remaining 23,300,000 EUR were intended to cover the costs of the machinery, special tools, scaffolding, installation material and preparation of the building site. The insurance for Unit 6, which is now shown under other expenses, accounted for another 9,000,000 EUR. A total of 89,000,000 EUR. Due to the newly acquired estimates based on the economic expansion of this industry, AIP 4 increases the price of an installer's man-hour from 18 to 22 EUR. This means that the overall value of the installation works is increased by 12,600,000 EUR, putting the new estimated value of the installation works at 69,300,000 EUR. According to an overview of the statistics of finished structures and data acquired from installation companies, man-hours usually represent ca. 70 % of the total cost of the installation, while the remaining 30 % are spent on machinery, special tools, scaffolding, installation material and preparation of the building site. Therefore we estimate that the costs estimated in AIP 3 are too low. We estimate that the value of this part of the installation will be approximately 30,700,000 EUR. The overall costs of the installation, accounting for the labour as well as all essential supporting activities, are estimated at 100,000,000 EUR. Our estimate of the installation has therefore increased by 20,000,000 EUR, but due to the elimination of the insurance from this section and because a certain increase of the value of the installation work had already been predicted in "Annex 1 to AIP, rev. 3 (October 2009)", AIP 4 only predicts an increase of 4,510,000 EUR.

Projected increase: 4,510,100 EUR

1.2.4.2.4 RESERVATION CONTRACT

The resulting difference is the result of taking into account the time value of money (discounting the payments).

Projected increase: 413,400 EUR

1.2.4.3 FLUE GAS DESULPHURISATION (FGD)

1.2.4.3.1 CHANGING THE TECHNOLOGY

The contracting authority ŠTPP issued an invitation to tender for the supply of the Flue gas desulphurisation equipment for Unit 6 on 8 March 2008. After the conclusion of two-stage negotiations, the contract was signed on 22 June 2009. According to the contract No RDP-01 the supplier is obliged to supply five circulation pumps and five spray planes with spray nozzles. The legislation which was in effect during the period from the signing of the contract until the Environmental permit was received (Decree on the emission of substances into the atmosphere from stationary sources of pollution, Decree on the emission of substances into the atmosphere from large combustion plants) permitted emission into the atmosphere from stationary sources and from large combustion plants up to 200 mg/Nm^3 SO_2 (dry, 6 % O_2), which is also the contractual warranty value. This legislation is still in force.

ŠTPP received an Environmental permit from the Ministry of the Environment on 16 February 2011. It states that the permissible value of sulphur oxide expressed as SO_2 emission into the atmosphere by the VKN6 (boiler – N54) is 100 mg/Nm^3 (dry, 6 % O_2). ŠTPP had already set aside the space for an additional pump and an additional spray nozzle plane in the tender documentation and in the final draft of the contract No RDP-01. The additional circulation pump and spray plane will not be sufficient for

achieving such strict permissible emission values, it will also be necessary to take additional measures: raising the scrubber by 0.8 m, changing the height of the spray planes, manufacturing wall rims, planning for the option of adding additives. The planned changes include the following sets:
- Circulation pump, circulation 11,500 m^3/h, pressure altitude 19 m, electric motor 1300 kW
- Intake (DN 1400) and pressurised (DN 1200) part of the circulation pipeline
- Fittings and compensators
- Spray pipeline made of Alloy 31
- Alloy 59 lining for raising the scrubber
- Wall rims
- Sieve on the intake pipeline
- Electrical equipment and control system, including peripheral measuring
- Services (planning the PZI, workshop documentation, QC documentation and performance control during the manufacturing and installation stage, installation supervision, testing, commissioning, training, supervising the warranty period, warranty measurements, construction site insurance, bank guarantees etc.)

Projected increase: 2,500,000 EUR

1.2.4.3.2 ESCALATION

Article 3 of contract No RDP-01 with the title "Contract price" also includes the escalation formula for calculating price differences based on changes of the pricing factors of the formula (labour costs, material costs). The contract was signed in a time when the prices of precious metals were low. Since the contract was signed, the prices of these metals have been rising constantly, while the increase of the labour cost has been negligible. Our calculations of the escalation had shown that the escalation cost will amount to ca. 7,000,000 EUR. Additional negotiations on cancelling the escalation formula were carried out with the supplier, and the expense of the abolition amounts to ca. 3,500,000 EUR. The elimination of the formula also eliminated the risk of changes in the pricing factors of the formula. Because the defined escalation was already taken into account in "Annex 1 to AIP, rev. 3 (October 2009)", AIP 4 only foresees an increase in the amount of 876,600 EUR.

Projected increase: 876,000 EUR

1.2.4.3.3 ADDITIONAL WORKS

When the final offer for the supply of the flue gas desulphurisation equipment for Unit 6 was being acquired, some parts of the technological assembly were only estimated due to deficient data on other FGD 6-related packages (transport of by-products – vacuum belt filters and mixing plant). It was possible to accurately define all the technology after the PGD documentation for the other packages was received. In this respect, it was necessary to change the product pumps and the implementation of the transport air compressors.

Projected increase: 83,000 EUR

1.2.4.4. COOLING SYSTEM

Due to a shortage of space, the cooling tower is located to the SW of the new Unit 6, on a plateau which will be approximately 5 m higher than the main technological equipment plateau and its construction will be made possible by an excavation of the hill. The soil composition is very heterogeneous and a tectonic zone with ruptured ground layers runs through the middle of the foundation ring in a N–S direction, which is also stated in the geomechanical reports. It has been established that the foundation system proposed by the IP would be inappropriate due to the composition and load capacity of the soil, the load and structural requirements for the cooling tower (especially the shell), and considering Eurocode (earthquake etc.), VGB R610 guidelines, the report on earthquake parameters, wind and other impacts.

During the stage of preparing the PGD, the solution for the foundations was being coordinated between the geomechanic, the architect – structural engineer and the revisor.

In accordance with the decision to channel the flue gas into the cooling tower (a technical standard for newly built thermal power plants), and based on the Immission study of the impact on the environment and the Report on negative impact on the environment, the height of the cooling tower needed to be increased.

The initial height from the IP from 2007, which was 129.7 m (above height +365.000), was increased to 162 m (above height +365.000) which is within the tolerance of the requirements set out by the Municipal detailed spatial plan (OPPN) and within the requirements of the immission study.

Due to this change, the own mass of the outer structure of the cooling tower has also increased, causing greater vertical and horizontal loads in combination with the wind, temperature and especially earthquakes.

Based on additional geomechanic research, it was established that the soil in the northern section of the cooling tower has poor load-carrying capacity, which led to the solution with 30 m long 118 cm diameter piles.

Due to the demanding nature of the cooling tower structure and the fact that the soil is very heterogeneous and changing, the implementation of a test pile was proposed and carried out in August 2010. After the test pile experiment proved that the soil's load bearing capacity is actually higher than it was calculated on the basis of empirical data obtained from the geomechanical research, it was proposed that the initially planned 30 m piles be shortened to 18 m.

An increase of the costs arising from building the foundations occurred due to the changes described above. It is a fact that the cooling tower is a very complex and sensitive structure (the shell is only 18 cm thick in a certain part), which is required to function flawlessly throughout the service life of Unit 6. The great loads can, in case of poor or inadequate foundations, cause subsidence and consequential cracks in the shell, which can in combination with the damp (the walls are dampened) and partially aggressive (flue gas) atmosphere lead to accelerated deterioration of the concrete and reinforcements. Reparation of such damage is problematic, lengthy and expensive.

Resulting from the technical facts described above, the foundations of the cooling tower described in the tender documentation and costed in the concluded contract have been changed. Due to the essential change of the cooling tower's foundations, a new evaluation of the foundations was carried out on the basis of the PZI documentation. In connection with these additional works, additional costs in the amount of 1,167,186 EUR have been generated, but they are still within the current prices from AIP 3, making the investment value of the package slightly lower despite the changes.

Projected decrease: 236,700 EUR

1.2.4.5. WATER PREPARATION

The increased costs of this package result from the fact that the ammonia water storage facility was initially planned within the ecological restoration (retrofitting with DeNOx) of Unit 5 and would have been installed even before Unit 6 became operational, during the scheduled overhaul of Unit 5 this year (2011). In the future, the facility would serve Unit 5 as well as Unit 6. The projected price of the new ammonia water storage facility is 2,300,000 EUR. A part of the increase is due to a more detailed survey during the planning of the PGD, based on the survey from IDP, which was the basis for the investment programme.

Projected increase: 2,419,000 EUR

1.2.4.6. COAL TRANSPORT

The reasons for the cost increase in this package are based on the decision to include the expenses of converting the existing transport system from PE24 to PE05, which was planned as part of the overhaul of Unit 4, in the Unit 6 works. The estimated value of the conversion is 500,000 EUR.
Other reasons for the price increase include:
- Informative offers acquired in accordance with the elaboration of detailed surveys for the PGD documentation, which served as a basis for the estimate of the investment value. The architects and engineers of ŠTPP coordinated the solutions for the end state of the Coal transport package at regular meetings. The solutions deviated from the IDP solutions in some parts, as additional needs emerged further along the planning process.
- In accordance with the fire safety study and the explosion risk study, all sifting stations in the coal transport line and all the associated equipment must be designed in an ex. design.
- Inclusion of the construction installation in the technological part.
- It was necessary to prepare a new static analysis with additional concrete and steel reinforcements, because the IDP did not take into account the effect of transport bridges on the 6 UED 01 sifting station. A new static analysis for all other steel constructions was also prepared, which also contributed to the price increase.
- Implementation of washable steel bridges.
- The strength of the coal transporters needed to be increased in the PGD after re-calculation.
- Two belt weighers, omitted from the IDP, needed to be implemented.
- The price of steel and electrical material has increased significantly since the IDP was prepared.

Projected increase: 1,344,200 EUR

1.2.4.7 PRODUCT PROCESSING

The cost increase of this package is based on the changes made in the stage of preparing the PGD documentation. The cost estimate in AIP 3 is based on the IDP, which did not include detailed surveys and actual quantities. Later stages of the planning process showed that some changes to the project are required for safe and reliable operation of Unit 6, including the following:
- Informative offers acquired in accordance with the elaboration of detailed surveys for the PGD documentation, which served as a basis for the estimate of the investment value. The architects and engineers of ŠTPP coordinated the solutions for the end state of the Product processing of Unit 6 package at regular meetings. The solutions deviated from the IDP solutions in several sections.
- After re-calculating the by-product production balance, it was necessary to increase the existing tubular conveyor from 200 mm to 250 mm of diameter, increasing the transport capacity by over 50 %, as well as increasing the quantity of the conveyor belt. As a result, the design from the IDP where the belt only linked to the existing one close to Unit 4 also needed to be changed. The new design of the tubular transporter sifts onto the existing tubular transporter from Unit 4 in the vicinity of Unit 5, accounting for the fact that due to the change in the Unit 6 transporter diameter, the tubular transporter from Unit 4, which runs on to the transitional landfill, also needs to be modified. (Thus, it is necessary to replace 1300 m of the tubular transporter instead of 300 m.) In both cases, the structure changes and the power of the drives has to be increased due to the change in diameter.
- A significant change of the circulation pipeline for gypsum from FGD 6 was also implemented. When FGD 6 was being planned, insufficient data on by-product transport was available, making the solution from the IDP inadequate. For the system to be able to allow the required parallel operation of two vacuum filters, the circular pipe from the FGD to the vacuum filters above the gypsum silo must be extended.

- The IDP only took one belt filter into account, while the PGD accounts for two vacuum filters to achieve 100 % operating reserves. Consequentially, the steel construction in the vacuum filter facility must also be changed.
- The IDP did not include mechanical installations for pneumatic ash transport to the ash silo. The architect's estimate for this part is 2,500,000 EUR.
- Inclusion of the construction installations in the technological part.
- Changes due to the requirement for a rapid lowering of the level in the product tank and for adding a greater proportion of dehydrated gypsum to the stabilizer in accordance with the Slovenian technical approval certificate for the stabilizer. The certificate requires that the gypsum (suspension and dehydrated) be mixed with ash into a homogeneous mixture, which can only be achieved by mixing in a stirrer. This requires a change in the existing concept of retrieving dehydrated gypsum from the gypsum silo. It was necessary to abolish dispensing the dehydrated gypsum directly onto the tubular belt, and to enable transport of this gypsum into the stirrer under the gypsum silo instead.
- Larger gypsum reservoir and larger gypsum pumps.
- The re-calculation of the by-product balance has shown that it was necessary to increase the stirrers, which also means an increase of the power of the drives, to ensure more reliable operation.
- A transporter leading to the stirrer in the mixing plant was added due to the increased quantity of dry gypsum.
- The price of steel and electrical material has increased significantly since the IDP was prepared.

Projected increase: 9,642,500 EUR

1.2.4.8 TECHNOLOGICAL LINKS

The equipment within the project was procured according to specific functional assemblies. Grey areas not covered by the contract are forming between these sets, generating the need for additional orders to connect these assemblies into a whole. This additional section covers mechanical and electrical connections between individual structures and equipment.

Projected increase: 2,000,000 EUR

1.2.4.9 CONNECTION TO THE ELECTRICITY SYSTEM OF THE REPUBLIC OF SLOVENIA

The contracting authority Temoelektrarna Šoštanj d.o.o. has not yet issued an invitation to tender for the supply of equipment for the connection of the units to the electricity system of the Republic of Slovenia (ES RS) due to the fact that the method of connecting Unit 6 to ES RS has not yet been determined. This is also the reason that the expense has not yet been shown. After conducting a study entitled Connection of Units 4, 5 and 6 to the transmission grid of Slovenia, and reaching an agreement with ELES d.o.o., we have reached the conclusion that Unit 6 will be connected to the existing 400kV transmission grid through the new GIS switchyard.
To enable the connection of Unit 6 to ES RS (on the 400kV transmission grid), the construction and acquisition of the following equipment is required:
- New GIS switchyard structure
- A cable tube between the 06BAT10 block transformer and the GIS switchyard facility,
- 400 kV GIS field with a connecting cable towards the 06BAT10 block transformer and SF6/air end fittings towards the 400 kV DV TEŠ – Podlog
- 400 kV cable connection between the 400 kV GIS field and the 06BAT10 transformer with cable end fittings
- Control, protection and meter readings enclosure at the GIS switchyard for the 400 kV GIS filed of Unit 6

Projected increase: 3,500,000 EUR

1.2.4.10 OTHER

The initial estimates did not take into account:
- Mechanical supervision of the pressurized section of the boiler, steam pipelines and pressure vessels – estimated at 380,000 EUR
- Mechanical supervision of steel structures and ducts – estimated at 350,000 EUR

External supervision of such complex facilities is essential for ensuring the quality of the materials used in the construction of the facility (iron, pipes, equipment etc.). Most of the takeovers are planned to be carried out by the contracting authority's and engineer's personnel. However, the contract determines that due to the fact that this personnel does not have specific expertise, external experts with required know-how and equipment will be hired. These expenses are not covered within the investor expenses.

Projected increase: 730,000 EUR

1.2.4.11 INVESTOR EXPENSES

The 17,927,200 EUR increase results from the fact that the initial estimate did not include the following expenses:
- The estimation of the cost of designing the main power facility was too low; the new realistic estimate of 1,900,000 EUR was determined based on experience with similar facilities.
- The engineering costs were also entirely underestimated. Engineering services are essential due to the complexity of the structure and have now been estimated based on experience with similar facilities. Estimated at 6,000,000 EUR.
- The initial estimate did not include the costs of energy producing raw materials for the testing period, estimated at 2,700,000 EUR.
- A great number of studies and expert reports were conducted and a great number of expert opinions acquired due to the complexity and with the purpose of proving the viability of the project. The extent could not have been predicted and the investor expenses have increased significantly.
- Additional funds amounting to 600,000 EUR have been set aside for supervision.
- Additionally, we have evaluated the costs for external consultants which the project will also need in the future.
- Funds for legal and economic consulting for acquiring financing sources (EIB and EBRD loan) have also increased. This need will continue in the drawdown stage.
- The impact on the environment should be carefully controlled; therefore, we have evaluated it additionally. The project also includes a great amount of international official correspondence, creating the need for external translators. The cost of the translations has been evaluated additionally due to the fact that the range of the translations exceeds the expected expense.
- The costs of the guarantees issued by the parent company HSE were not included in the initial estimate; they are estimated at 6,540,800 EUR.

1.2.4.12. INSURANCE

The expenses of the construction site insurance were initially included in the installation section and were estimated at 9,000,000 EUR. They are now shown within other expenses in accordance with general practice. An insurance contract in the amount of 6,769,100 EUR has been signed for the insurance of the construction of Unit 6, resulting in a 2,230,900 EUR decrease of the insurance expenses. Due to the fact that the table under 1.2.3 shows the insurance expenses separately and not within the installation costs as in AIP 3, these costs present themselves as an increase.

Projected increase: 6,769,100 EUR

1.2.4.13 FINANCING EXPENSES

The estimate of the financing expenses is lower than in AIP 3. The main reason is the delay in the drawdown of loans and lower margins achieved at the European Bank for Reconstruction and Development (EBRD). The dynamics of the drawdown of loans have also changed since AIP 3. Due to the delay in the issuing of the state guarantee, the EBRD loan is planned as the source for most of the outflow in 2011.

Projected decrease: 2,508,700 EUR

1.2.5 COMPARISON OF FINANCING SOURCES

1.2.5.1 CONSTANT PRICES

	AIP 4		*Annex 1 to AIP 3*	
	000 EUR	*%*	***000 EUR***	*%*
1. Equity funds	**445,939.1**	**37.3 %**	**412,693.0**	**36.8 %**
5) ŠTPP	129,807.9	10.9 %	124,185.7	11.1 %
6) HSE	316,131.2	26.4 %	288,507.3	25.7 %
2. EIB loan	**550,000.0**	**46.0 %**	**523,514.1**	**46.7 %**
3. EBRD loan	**200,000.0**	**16.7 %**	**185,193.6**	**16.5 %**
Total	**1,195,939.1**	**100.0 %**	**1,121,400.6**	**100.0 %**

1.2.5.2 CURRENT PRICES

	AIP 4		*Annex 1 to AIP 3*	
	000 EUR	*%*	***000 EUR***	*%*
1. Equity funds	**469,747.0**	**36.1 %**	**439,117.1**	**36.9 %**
7) ŠTPP	144,819.3	11.1 %	131,058.9	11.0 %
8) HSE	324,927.7	24.9 %	308,058.2	25.9 %
2. EIB loan	**550,000.0**	**42.2 %**	**550,000.0**	**46.3 %**
3. EBRD loan	**200,000.0**	**15.4 %**	**200,000.0**	**16.8 %**
4. HSE group loan	**83,000.0**	**6.4 %**		
Total	**1,302,747.0**	**100.0 %**	**1,189,117.1**	**100.0 %**

Given the increase of the investment, securing additional financing sources was required in accordance with the contracts concluded with EBRD and EIB. In accordance with these contracts, the parent company HSE is required to provide financing sources in the event on an increase of the investment costs. Based on these demands, ŠTPP and HSE equity sources have been increased within the financing sources. In addition, the HSE group will ensure additional sources in the form of loans.
The HSE group’s potential enables the increase of the equity funds for the intended value. Additionally, the HSE group has sufficient liquid assets to ensure a loan within the HSE group. A credit agreement will be concluded for such a loan within the HSE group.

2. SUMMARY OF THE AMENDED INVESTMENT PROGRAMME REVISION 4

2. 1. INVESTOR

Investor: Termoelektrarna Šoštanj, d.o.o., Cesta Lole Ribarja 18, Šoštanj

Registration number: 5040388

Industry code: 35.122 Production of electricity in thermal and nuclear power plants

Investor's bank: Nova LB d.d., Ljubljana
UniCredit banka, Ljubljana
Banka Koper, Koper
Nova Kreditna Banka Maribor, Maribor

2.2 BASIC INFORMATION ON THE INVESTMENT

Name of the project: Construction of the replacement 600 MW Unit 6 in Šoštanj Thermal Power Plant
Investment manager: mag. Miran Žgajner

Location:

Appropriate and available space within the ŠTPP zone for building the new replacement Unit 6 is located in the area between the cooling tower of Unit 4 and old Units 1 to 3, in the location of the former cooling towers of Units 1 to 3, parking spaces and the administration building.

Purpose of the investment:

To maintain the volume of electricity production from the use of domestic coal with the help of state of the art technology.

Selected technology:

In the preliminary works stage – the findings from this stage are given in Section 5 – ŠTPP analysed current coal-fired energy production technologies, which would be appropriate for use in the new Unit 6. Pulverized coal combustion (PCC) technology with supercritical steam parameters (275 bar, 600/610 °C) in the so-called BoA (Betriebsoptimierte Anlagen) technology and 600 MW power on the generator terminals was selected as the most suitable technology.

Goals of the investment:

- Maintaining electricity production in ŠTPP with the use of domestic coal,
- Producing ca. 3,500 GWh of electricity with ca. 30 % lower coal consumption[2],
- Reducing the emission factor (kg CO_2 / kWh) from 1.25 to 0.87,
- Reducing the cost price of electricity by more than 20 EUR/MWh,
- Achieving a return on equity of at least 10 %,

[2] The reduction is estimated based on the weighted average efficiency of existing ŠTPP production units (Unit 3, 4, 5), which is between 32.5 % and 33 %. Compared to Unit 6, which will have a maximum efficiency of 43 %, this presents a ca. 30 % decrease.

- Ensuring the continued existence of the energy sector in the Šaleška Valley together with the Premogovnik Velenje coal mine,
- Fulfilling the EU climate commitments,
- Achieving an internal rate of return (IRR) higher than 7 %.

Time schedule for the realisation of the investment:

- Selecting the supplier for the MTE and signing the reservation contract	September 2007
- Signing the MTE contract	June 2008
- Signing the FGD contract	June 2009
- Signing the NTP for the MTE	December 2009
- Building permit for the MTE	March 2011
- End of contractual preliminary running	November 2014

Service life of the project: 40 years

Reasons for the investment:
- It is in the Republic of Slovenia's interest to function as an independent control area within ENTSO-E, therefore we must have units which are capable of ensuring secondary control which cannot be purchased from another control area. Unit 6 of ŠTPP can ensure this within its technological possibilities.
- Unit 6 of ŠTPP will be connected to the 400 kV network and will contribute significantly to the stability of the system as the second supporting point for maintaining appropriate voltage (in addition to the Nuclear Power Station Krško).
- In terms of providing reliable and quality electricity supply after 2015, Slovenia does not have many alternatives (especially regarding secondary control ancillary services). Considering the status of the Unit 6 project, this is the only option that can be carried out by 2015.
- The requirements for ancillary services will increase due to the energy sector's focus on increasing the power of renewable electric energy sources. These sources (especially wind and solar plants) cannot provide ancillary services but instead increase the requirements for those services. This also increases the significance of large power plants which for the moment remain indispensable.
- Diversity of production sources and energy sources is important for the country, and energy independence is especially important.

2.2.1 ORGANISATIONAL STRUCTURE OF THE PROJECT

When drawing up the new project organisation structure in the beginning of 2011, warnings listed in the due diligence by the company Poyry have been considered. They point out the weakness of the project team and question the ability of professionally matching the extremely strong group of the main contractor Alstom.

The organisational structure of the project can be observed in the diagram below. Individual bodies of the organisational structure have the following jurisdictions:

Project Council

The Project Council is led by the director of Termoelektrarna Šoštanj, but it no longer consists only of ŠTPP associates or people who are involved with certain project bodies as it is. The role of the Project Council has been expanded and it now engages in broader aspects of the project (relations with local communities, ecology, relations with state institutions), regularly monitors the progress of the project through the project team reports, and takes note of the difficulties and possible delays of the project. The Project Council can also form proposals for corrective actions. The Council consists of associates, representatives of the owner (HSE) and indirect owner (AUKN), sector policy makers (Ministry of the Economy and the Energy Directorate), representatives of the Ministry of the Environment and Spatial Planning, and representatives of the local community (coordinated proposal of the municipalities of Velenje, Šoštanj, and Šmartno ob Paki). Representatives of action groups, especially those in relation to ecology, could also be included in the Project Council. It is definitely a consultation body allowing the stakeholders to be included in the project and also informed about it.

Coordinating Committee of the Unit 6 ŠTPP project (KOP)

KOP is led by the director of Termoelektrarna Šoštanj; its other members are the director of the project, deputy director of the project, a representative of the active monitoring committee, and members appointed by the director by a special resolution. KOP analyses project group reports and takes a position on issues that could not be resolved within the project group and issues that exceed the project group’s jurisdiction.

Project Group (key operational body for the implementation of the investment, representing and carrying out the investor’s interests)

The organisational structure of the project follows modern principles and covers all necessary fields. It is formed in a way which makes it easier to follow the Construction Act and is based on FIDIC. The organisational structure emphasizes project management by the contracting authority and by the engineer. However, the new organisational structure of the project follows the old structure, especially in the top part, in order to avoid destroying those existing bodies and procedures that have worked well.

Funding Group

The group was named by a resolution by the director of ŠTPP. The group consists of ŠTPP and HSE associates and is supported by external associates from the legal and financial field. The group’s task is to ensure optimal funding, and especially to regularly assess the risks of financing.

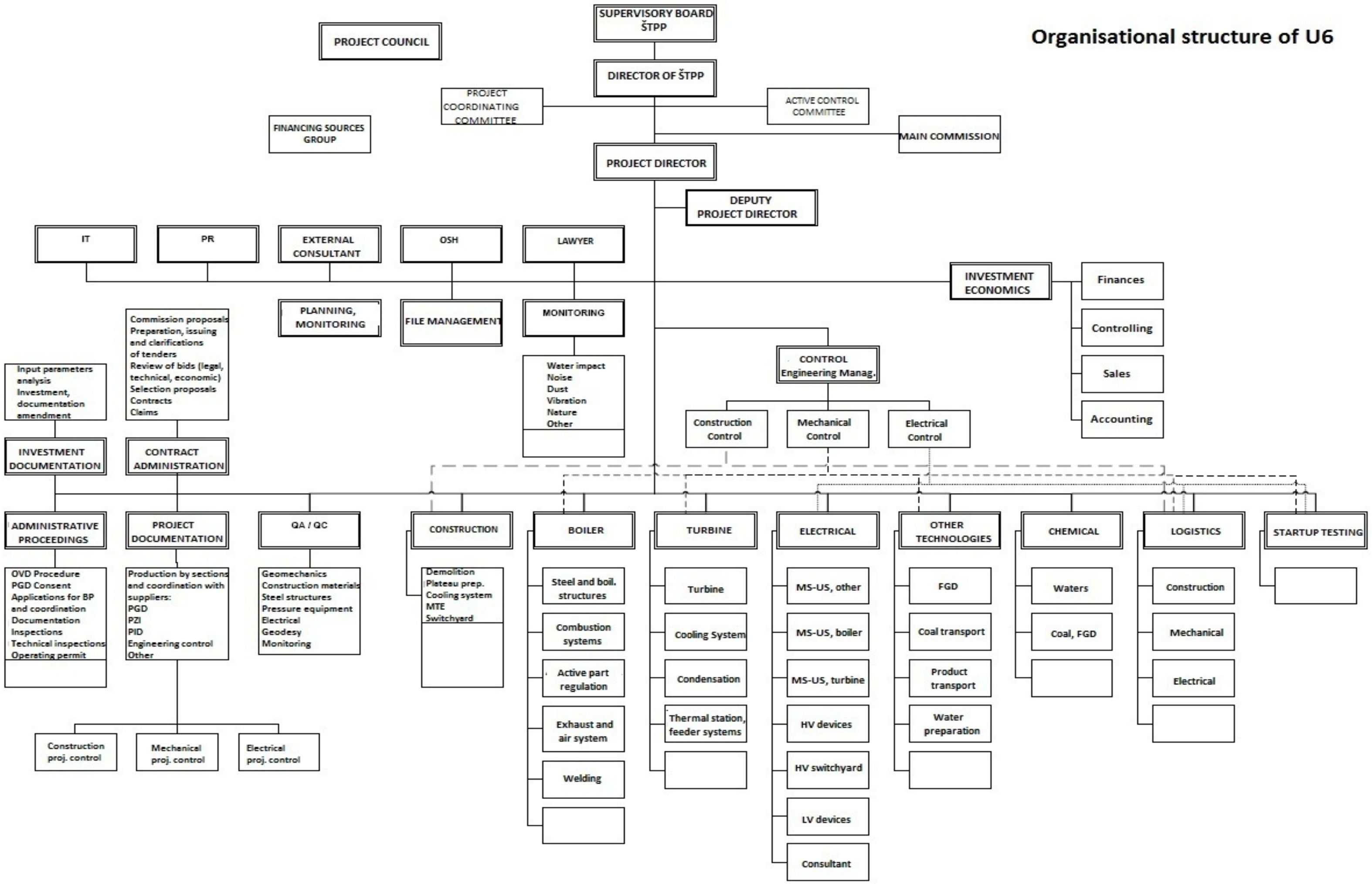


Table 2.1: Organisational structure of the project

2.3 BRIEF DESCRIPTION OF THE INVESTMENT

Demands for more economically and ecologically rational energy production in ŠTPP inevitably lead to the requirement for replacing existing units with a new one. In addition, it is important to note the age and wear of the existing structures. Investment in Unit 6 is investment in replacing existing production, and its purpose is to retain employment and to help with the restructuring of Premogovnik Velenje coal mine. The investment will provide the Premogovnik Velenje mine with sufficient own resources for restructuring. The need for the Republic of Slovenia to invest directly into the restructuring of the Premogovnik Velenje coal mine will thus be avoided.

In the preliminary works stage – the findings from this stage are given in Section 5 – ŠTPP considered the latest coal-fired energy production technologies, which would be appropriate for use in the new Unit 6. Pulverized coal combustion (PCC) technology with supercritical steam parameters (275 bar, 600/610 °C) in the so-called BoA (Betriebsoptimierte Anlagen) technology and 600 MW power on the generator terminals was selected as the most suitable technology.

The new structure will be located west of the existing structures, on a plateau which will become available after the removal of cooling towers for Units 1, 2 and 3 and the old administration building. It will be built on an E–W axis, with the engine room next to Unit 1, and the bunker, boiler room, electrostatic precipitator and desulphurisation plant in the West, facing Šoštanj. The cooling tower is South of the Unit, built into a hill.

Coal from the nearby Premogovnik Velenje mine will be used as fuel. It will be transported into the boiler bunkers on reconstructed existing conveyors of Unit 4 and on newly built ones to Unit 6.
The cooling water will be provided by an extension of the existing inflow facility on the Paka river and new decarbonisation will be installed. The existing chemical water treatment will provide the demineralized water.

The products of combustion and desulphurisation (ash, gypsum and slag) will be marketed to the construction industry, and the surplus will be processed into a stabilizer for mine subsidence control. ŠTPP is already successfully marketing waste products. The demand for ash, gypsum and slag is greater than the available quantity. As ŠTPP already realises ca. 1 million EUR of revenue from these products, it is estimated that the marketing of waste products will be successful in the future as well.

Unit 6 will operate without waste water discharge. This will be achieved by recirculating and purifying industrial water and reusing it. Only the cooling tower bilge, which will fully meet the environmental protection conditions for discharge into the watercourse, will be discharged into the river Paka. The solid waste from the waste water treatment will be handled by an authorised client – a concessionaire.

The unit will meet all environmental protection conditions in accordance with EU regulations. Due to the limits of noise impact, the equipment will be set up in closed structures with adequate protection for noise dampening.

A space will be provided next to the unit to set up a device for extracting CO_2 out of flue gas (CO_2 Capture and Storage – CCS Ready), if regulations in the future demand it and if CO_2 storage will be commercially viable.

A more detailed description of the investment will follow below.

2.4 ESTIMATED VALUE OF THE INVESTMENT AND FINANCING SOURCES

Estimated value of the investment

	Constant prices	***Current prices***
	000 EUR	***000 EUR***

Construction work	**74,868.2**	**75,969.3**
Preparatory work	20,485.7	20,569.7
MPF	34,663.3	35,342.0
Other structures	10,680.7	11,000.0
Administration building	8,507.6	8,507.6
Other	530.9	550.0
Equipment	**964,273.6**	**1,063,120.7**
MTE	699,156.3	699,434.0
MTE escalation	9,372.6	100,056.5
MTE installation	97,205.9	100,000.0
Reservation contract	25,000.0	25,000.0
FGD	78,553.0	82,053.0
Water treatment	7,515.9	7,700.0
Coal transport	4,986.9	5,100.0
Product processing	13,000.1	13,500.0
Cooling system	23,338.1	24,047.2
Technological links	1,989.4	2,000.0
Connection to the electricity system of RS	3,446.7	3,500.0
Other	708.8	730.0
Other	**34,118.6**	**35,106.9**
Investor expenses	27,574.3	28,337.8
Insurance	6,544.3	6,769.1
Total	**1,073,260.4**	**1,174,196.9**
Financing expenses	122,678.7	128,550.2
TOTAL	**1,195,939.1**	**1,302,747.0**

Of that:

HSE guarantee expenses (000 EUR)	6,166.6	6,540.8

Estimated value EUR/kW[3]	**1,788.7**
Of that:	
Preparatory work	34.1
Equipment with installation and construction work	1,731.9
Investor expenses	42.2

Financing sources

	Constant prices		***Current prices***	
	000 EUR	***%***	***000 EUR***	***%***
1. Equity funds	**445,939.1**	**37.3 %**	**469,747.0**	**36.1 %**
- ŠTPP	129,807.9	10.9 %	144,819.3	11.1 %
- HSE	316,131.2	26.4 %	324,927.7	24.9 %
2. EIB loan	**550,000.0**	**46.0 %**	**550,000.0**	**42.2 %**
3. EBRD loan	**200,000.0**	**16.7 %**	**200,000.0**	**15.4 %**
4. HSE group loan	**0.0**	**0.0 %**	**83,000.0**	**6.4 %**
Total	**1,195,939.1**	**100.0 %**	**1,302,747.0**	**100.0 %**

Due to known facts about the amount of the EIB and EBRD loans, the values of both loans are given in the same amount at constant as well as current prices. The difference in the value of the investment between both

3 So-called »Over Night Costs«, which are used for comparing investments and therefore the costs per unit do not include financing expenses and the impact of inflation.

methodological approaches (constant prices – current prices) is therefore guaranteed by the HSE group loans, which will also be the situation in reality.

2.4.1 DETAILED WORKS, EQUIPMENT AND SERVICES BREAKDOWN

CONSTRUCTION WORK

Preparatory Works

The preparatory works include all earthmoving and construction works needed for the preparation of the construction site and building the foundations of the cooling tower, the main power facility and other structures. These works include the costs of all necessary purchases of land, demolition of existing structures (houses, Elkroj, old administration building, roofs etc.), setting up the western drive-in plateau and the roundabout, preparation of the cooling tower construction plateau, arranging preassembled plateaus (P0, P1, P2, P3, P4 etc.), preparing transport routes and improving traffic infrastructure in Slovenia for special freight transport.

MPF (Main Power Facility)

Before the scheduled start of the installation, the construction of the main power facility building must be completed. The main power facility consists of the engine room, concrete bunker, boiler room and flue gas desulphurisation structure. The mechanical installations and electrical installations for the construction and the suitable cranes are also a part of the main power facility.

Other structures

Coal transport, product (ash, gypsum, slag) transport and water preparation facilities, an additive silo, an ash silo, a slag silo and ammonia water tanks (for the DENOX equipment), the GIS switchyard structure, landscaping structures and technological links must be built for the operation of Unit 6.

New Administration Building

The investment value includes the value of a new administration building, which will be built due to the fact that the old administration building was located in the space provided for Unit 6 and therefore had to be demolished.

Other

External supervision of material quality, geodetic and geomechanical supervision must also be ensured during the construction stage. External supervision guarantees the quality of materials built into the structure (concrete and concrete reinforcements), while geodetic supervision harmonizes the construction works with the equipment.

EQUIPMENT

Main Technological Equipment (MTE)

The main technological equipment represents the majority of the equipment necessary for the unit to function and the equipment necessary for ensuring the unit's guaranteed parameters. The MTE is divided into the following sets:

a) Turbo generator with auxiliary equipment

- Steam turbine
- Generator
- Regenerative heating of feedwater and condensate
- Cooling system
- Thermal station
- Condensate cleaning
- Auxiliary devices for the turbo generator
- Maintenance devices and equipment

b) Boiler with auxiliary equipment

- Boiler pressure system
- Pipelines
- Supply pump
- Firing
- Exhaust and combustion air system
- DENOX device
- Load-bearing steel constructions for the boiler and boiler room
- Auxiliary devices for the boiler
- Maintenance devices and equipment
- Landings and stairways

c) Control system
- Main control system (MCS)
- Local control systems
- Peripheral equipment

d) Electric power junction
- 400 kV equipment
- Transformer unit
- Transformer for the Unit's own consumption
- Transformer for general own consumption
- Energy junction
- Grounding

e) Supplier services
- Package boundary coordination
- Project elaboration and technical documentation
- Assembly and assembly control
- Initiation testing and preliminary running
- Performing warranty measurements
- Quality assurance
- Training the contracting authority's personnel
- Servicing during the warranty period

FGD

A flue gas desulphurisation plant needs to be set up for the purposes of desulphurising flue gases. The FGD is divided into the following sets:

a) Technological equipment
- Scrubber with auxiliary equipment
- Flue gas ducts
- Preparation of the absorbent
- Gypsum discharge
- Emptying system
- FGD auxiliary equipment

b) Steel constructions, roof and facades
- Load-bearing steel constructions
- Landings and stairways
- Roof and facades

c) Control system
- Main control system (MMS)
- Local control systems
- Peripheral equipment

d) Electrical equipment
- MV – devices 10 kV
- LV – junction

e) Supplier services
- Package boundary coordination

- Project elaboration and technical documentation
- Assembly and assembly control
- Initiation testing and preliminary running
- Performing warranty measurements
- Quality assurance
- Training the contracting authority's personnel
- Servicing during the warranty period

Water Preparation
Unit 6 will be able to use the existing equipment in ŠTPP to prepare demineralized water. However, a new reactor with complete auxiliary devices will need to be built for the preparation of decarbonised water. The main sets of equipment are:
- Decarbonisation
- Cooling water filtration
- Inflow facility for crude water
- Waste water treatment

Coal Transport
The existing transport system of Units 1 – 4 will be used to supply coal to the Unit, but it will need to be partially rebuilt, its capacity increased and extended with all necessary auxiliary devices.

Product Processing
The product processing equipment consists of the following systems:
- Ash transport system
- Gypsum transport system
- Slag transport system
- Fly ash silos
- Gypsum silos
- Slag silos

Cooling System
The implementation of an equipment cooling system on Unit 6 requires the construction of a cooling tower, assembly of all necessary cooling tower equipment and a connection with the main technological equipment. The cooling system equipment consists mostly of the following systems:
- Flue gas outlet
- Cooling tower spray system
- Cooling pipes with fittings
- Cooling pumps with electric equipment

Technological Links
The equipment within the project was procured according to specific functional assemblies. Grey areas not covered by the contract are forming between these sets, generating the need for additional orders to connect these assemblies into a whole. Electrical and mechanical technological links ensure the connections between individual structures and equipment.

Connection to the Electricity System of RS
For the purposes of connecting Unit 6 to the electricity system of RS we have come to the conclusion that Unit 6 will be connected to the existing 400 kV power line through a new GIS switchyard. The following equipment will be included in the connection of Unit 6:
- 400 kV GIS field
- 400 kV cable connection
- Control, protection and meter readings in the GIS switchyard

Other
External quality supervision for the pressurized section of the boiler, steam pipelines, pressure vessels, steel constructions, and ducts must be provided during the construction work stage.

OTHER

Investor Expenses
This includes all other expenses required for the construction of Unit 6, such as:
- Project engineering
- Quality control
- Supervision of construction works in accordance with the Construction Act
- Engineering
- Studies and documentation
- Raw materials until the start of electricity production (testing)
- Unit 6 insurance costs during the construction
- Expert opinions
- External consultants
- Consultations in legal, economic and technical fields
- Translations

2.5 EFFECTS OF THE INVESTMENT

The electricity and CO_2 emission credit price scenarios predicted in the NEP draft were used to calculate the effects of the investment. Because the NEP draft only predicts the prices of electricity and CO_2 emission credits until 2030, the same change as the average change in the entire period that the NEP draft predicts prices for was used for both items for the period 2030–2054. In addition to accounting for changes of both items predicted in the NEP draft, we have also increased the expenses of all items that ŠTPP will have during the project (coal costs, labour costs, additive costs etc.) by appropriate indices.

Several alternative scenarios in respect of input data for calculating the investment economics were possible when the programme was being prepared, and all options have positive as well as negative characteristics. Based on comparisons of different scenarios, we therefore decided that it would be best to use the price scenarios from the NEP draft.

Financial and market effects:
The financial and market effects have been prepared in accordance with the Decree on the uniform methodology for the preparation and treatment of investment documentation in the field of public finance (http://www.uradnilist.si/1/objava.jsp?urlid=200660&stevilka=2549), which imposes a 7 % discount factor for investments financed in accordance with this decree.

Investment repayment period	15 years
NPV with a 7 % discount rate	83.6 million EUR
IRR	7.59 %
RNPV	0.108
Relative benefit indicator	1.027
Return on equity (ROE)	13.6 %

An economic flow of the project, including the period of implementing the project as well as the 40-year service life (economic life of the project), has been prepared to calculate the project's financial and market performance. Economic inflow consists of revenue from the sales of electric and thermal power, revenue from ash and gypsum sales, and income from ancillary services, while the economic outflow consists of the investment value (excluding financing costs), operating costs (excluding depreciation and financing costs) and income taxes generated by the project. A discount rate of 7 % has been used. The following economic markers have been calculated:

a) Investment Repayment Period: 15 years
The investment repayment period is the time (period expressed by a number of years) in which the generated liquid assets cover the investment costs. This is achieved when the economic flow of the investment becomes

cumulatively positive. The economic life of a project must therefore be longer than the investment repayment period, or a correct result cannot be deduced from the economic flow. Considering the fact that the economic life of the project is 40 years, the investment repayment period indicator is strongly positive.

b) Net Present Value (Discount Factor – 7 %): 83.6 million EUR
This method requires that we discount investment expenditure and return on an initial term (t0) when the first investment expenditure occurs. By discounting the expenditure and return, we include the appropriate time component, making the amounts of return and investment expenditure in various units of time comparable. After that, we deduct investment expenditure from the sum of the discounted return.

$NPV=S\ R_t/(1+r)^t-S\ I_t/(1+r)^t$

NPV=net present value

R_t=return in period t

I_t=investment expenditure in period t

t=period (month, year …) 1, 2, 3 … n

r=discount rate

The discount rate expresses the required rate of return. A positive net present value shows that the return is greater than the investment expenditure. A negative net present value shows that the sum of the return with the discount rate used (required rate of return) is not high enough to compensate for the investment expenditure.

When assessing a single investment, the investment is viable if the net present value is greater than 0. When assessing several investments, we choose the investment with the highest net present value, provided that it is greater than 0.

The problem which appears when using the net present value method is choosing the appropriate discount rate, as the value of the discount rate has a significant impact on the value of the NPV. If we use the same return and investment expenditure values, the NPV will be higher if we use a lower discount rate, and lower if we use a higher discount rate. *Draga Stepko* says that "according to the western theory – the discount rate reflects subjective temporal preferences between the current and future expenditure and the investor's assessment of future returns in the present. But investors practically don't know discount rates; in fact they don't even try to know them." She therefore suggests that either the interest rate at which the investor can obtain a loan to finance the investment (if the investment is financed by external sources) or the return it could achieve if the funds would be placed in a financial investment (if the investment is financed by own sources) is used as the discount rate.

According to another theory, "companies use the weighted average of the cost of capital as the required rate of return". Consequentially, as the net return on equity is already reduced by the financing costs, the interest and cost of capital should not be included in the net financial flow from which the NPV is calculated.

The risk of the investment should also be taken into account. The average return on equity is structured as the return on various investment projects in the past, each with its own degree of risk.

Given that the costs of debt financing sources are more or less known; we can determine the expected return on equity based on the discount factor used.

WACC=SEBRD*CEBRD + SEIBA*CEIBA + SEIBB*CEIBB + SLHSE*CLHSE + SEF*CEF

SEBRD – share of the EBRD loan in the total value of the investment
CEBRD – cost of the EBRD loan
SEIBA – share of the EIB A loan in the total value of the investment
CEIBA – cost of the EIB A loan
SEIBB – share of the EIB B loan in the total value of the investment
CEIBB – cost of the EIB B loan
SLHSE – share of the HSE loan in the total value of the investment

CLHSE – cost of the HSE loan
SEF – share of equity funds in the total value of the investment
CEF – cost of equity funds

With an expected 7 % weighted average cost of capital (discount factor), the cost/return on equity in the price scenario from the NEP draft is higher than 13 %, which is a relatively very high return on equity and exceeds the return of comparable projects. The RS sectoral policy for energy sector projects, which is currently being prepared, will likely require a 9 % return on equity. If we use this required rate of return, the cost of capital – and consequentially the discount rate – would be around 6 %.

c) Internal Rate of Return: 7.59 %
The internal rate of return is the discount rate where the net present value equals 0. This can be expressed mathematically with the following formula:
$\Sigma Dt/(1+r)t = \Sigma It/(1+r)t$
When the formula is valid, the r represents the internal rate of return. The internal rate of return also tells us the amount of the interest rates that the investor can pay for the loan without incurring a loss in the event that the entire investment is financed by a loan.
The internal rate of return is used so as to compare it with the required rate of return. The internal rate of return must always be higher than the required rate of return.

d) Relative Net Present Value: 0.108
The relative NPV measures the net return per unit of investment costs. It is calculated from the ratio between the NPV and present value of investment costs and it represents a comparison between the sum of all discounted net inflows (NPV) and the sum of discounted investment costs.

e) Relative Benefit Indicator: 1.027
The relative benefit indicator is the ratio between the present value of all the benefits of the project and the present value of the costs. The indicator needs to be greater than 1 for the investment to be justified.

f) Return on Equity (ROE): 13.6 %
The rate is equal to net profit divided by equity capital. Return on equity is expressed as a percentage. It is used as a universal indicator of a company's efficiency, as it shows how much profit a company can generate in terms of the sources provided by its shareholders. Equity capital represents the value of the assets of a group belonging to the owners of the parent company.

The selected variant of the project is acceptable. The investment repayment period is shorter than the service life of the project, the net present value (NPV) is positive, the internal rate of return (IRR) is higher than the average cost of the financing sources, the relative net present value (RNPV) is positive, the relative benefit indicator is greater than 1, and the return on equity is higher than in comparable projects and it also exceeds the return which will likely be prescribed by the RS sectoral policy for energy projects (9 %).

Economic effects:
The economic evaluation proceeds from the assumption that the project inputs should be determined on the basis of their opportunity costs. The economic analysis is based on a corporate aspect. The financial flows from the financial analysis have been taken into account as the starting point of the economic analysis.
As already described in Section 1.2, the Guidance on the Methodology for carrying out Cost-Benefit Analysis for Investment Projects, prepared by the European Commission, was taken into account in the calculations. The European Commission in the "Guidance on the Methodology for carrying out Cost-Benefit Analysis" (http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf).

Results of the calculation:

Investment repayment period	15 years
NPV with a 5.5 % discount rate	356.8 million EUR
IRR	7.59 %
RNPV	0.449

Relative benefit indicator	1.096
Return on equity (ROE)	13.6 %

2.6 PRESENTATION AND INTERPRETATION OF RESULTS

The selected scenario of the project is acceptable. The investment repayment period is shorter than the service life of the project, the net present value (NPV) is positive, the internal rate of return (IRR) is higher than the average cost of the financing sources, the relative net present value (RNPV) is positive, the relative benefit indicator is greater than 1, and the return on equity is higher than in comparable projects and it also exceeds the return which will likely be prescribed by the RS sectoral policy for energy projects (9 %).
A more detailed interpretation of the results is given in Section 13.5.

3. INFORMATION ABOUT THE INVESTOR

3.1. GENERAL INFORMATION ABOUT THE INVESTOR

3.1.1. INVESTOR STATUS AND ACTIVITIES

Termoelektrarna Šoštanj d.o.o. is a limited liability company with one shareholder, i. e. Holding Slovenske elektrarne d.o.o. (HSE). On 14 Feburary 2006, the shareholder adopted a memorandum of association, which completely replaced the previous memorandum of association. The amendment of the registration of the company was implemented on 20 March 2006. The Šoštanj Thermal Power Plant is entered into the register of companies of the Celje District Court under registration no. 1/00522700. The registered office of the company is on Cesta Lole Ribarja 18, Šoštanj. The Šoštanj Thermal Power Plant is associated with the Holding Slovenske elektrarne d.o.o group with headquarters in Ljubljana, Koprska ulica 92.

Basic data of the company

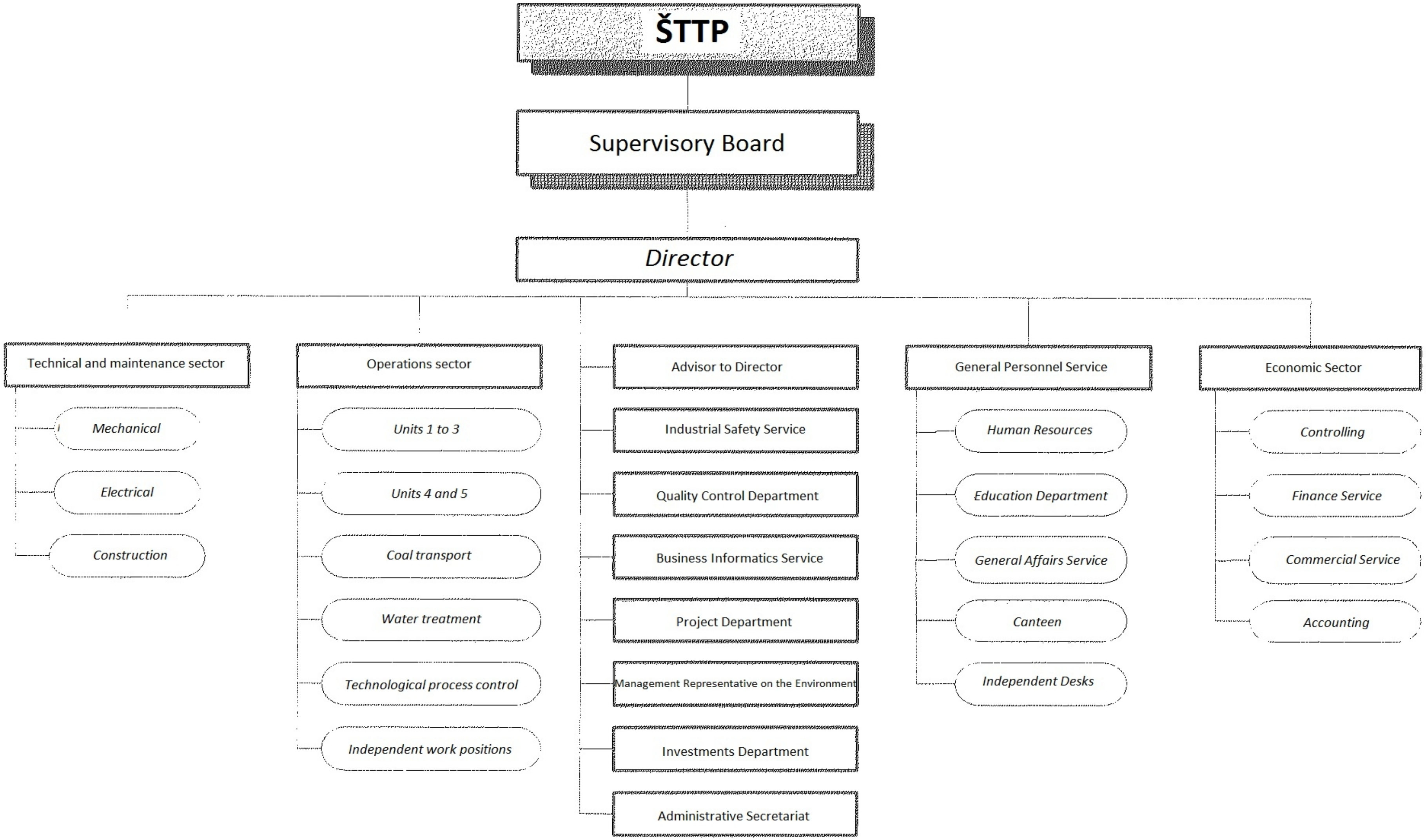
Name Termoelektrarna Šoštanj d.o.o.
Short name: TEŠ d.o.o.
Organisation structure: company with limited responsibility (ltd)
Main activity of the company: 35.112 Production of electricity in thermal and nuclear power plant, 35.300 Supply of steam and hot water
Headquarters: Cesta Lole Ribarja 18, 3325 Šoštanj
Registration: company is registered at the district court in Celje, number of registration: 1/00522700
Osnovni kapital (31 December 2010): 203.480.559 EUR
ID number: 5040388
Tax number: SI92189903
Account: Nova Ljubljanska Banka, UniCredit, Banka Koper, Nova kreditna banka Maribor
web page: www.te-sostanj.si
Director: Simon Tot, MSc
Ownership structure: 100 % Holding Slovenske elektrarne d.o.o.

The subscribed contribution and business share on 31. 12. 2008 is:

Shareholder	**Subscribed contribution**	**Business share**
Holding Slovenske elektrarne d.o.o.	118,021,759 EUR	100 %

The company's main activities are:
35.112 Production of energy in thermal and nuclear power plants
35.300 Steam and hot water supply

3.1.2. ORGANISATION CHART OF ŠOŠTANJ THERMAL POWER PLANT



3.1.3. MANAGING AUTHORITIES

The corporation is managed in accordance with authoritative judiciary rules, in accordance with the memorandum for establishing Termoelektrarna Šoštanj d.o.o., which was adopted by HSE d.o.o. as the only shareholder (last valid version is from 23 March 2011), and in accordance with good business practice. As determined by the memorandum of association, the management is done through the shareholder and the company bodies, namely the supervisory board and the director.

Shareholder:
In accordance with the provisions of the Companies Act, the shareholder is autonomous in making decisions regarding:

- changes and amendments to the memorandum of association;
- adoption of business policy foundations and the company development plan;
- adoption of the annual report, if the supervisory board has not approved the annual report or if the director or supervisory board transfers the decision on the adoption of the annual report to the shareholder;
- the business plan of the company;
- the use of distributable profit;
- granting a discharge to the director and supervisory board;
- division and termination of business shares;
- changes in the company's initial capital;
- status changes and company termination;
- election and dismissal of supervisory board members;
- appointing an auditor for the company;
- appointing a procurator and proxies, and
- other matters in accordance with regulations and the memorandum of association.

The shareholder cannot decide on business management issues, except when requested to do so by the director in the event of the supervisory board refusing to grant an approval for a certain type of transaction.

In accordance with Article 526 of the Companies Act, the shareholder notes all decisions into the register of decisions.

Supervisory Board:
The supervisory board consists of 6 members, namely 4 members representing the owner's interest (appointed and dismissed by the owner) and 2 members representing the interests of employees (appointed in accordance with the Worker Participation in Management Act). The supervisory board was expanded in March 2011 because of the demand of European Bank for Reconstruction and Development that the Supervisory board includes a representative that will represent interests of the bank and outsider community. The supervisory board members are appointed for a period of four years and can be appointed again after their mandate expires. In accordance with the Memorandum of association, the supervisory board has the following jurisdictions:

- supervising the company's business conduct;
- examining the composition of the annual report and the proposal for the use of distributable profit;
- composing a written report for the shareholder on the results of the annual report examination;
- approving the annual report or commenting on it;
- delivering opinions about the business policy foundations and the company development plan;
- granting authorisation of the company's business plan;
- proposing to the shareholder the adoption of decisions out of its jurisdiction or delivering an opinion on the director's proposals for the shareholder's adoption of decisions;
- appointing and dismissing the managing director;

- granting authorisation for the director's transactions in accordance with the memorandum of establishment;
- concluding an employment contract with the director;
- adopting the Rules of Procedure of the supervisory board;
- may request reports on other issues.

The supervisory board can also perform other tasks in accordance with regulations and the shareholder's decisions.

The supervisory board consists of members:
- Janez Keržan, MSc, chairman
- Dean Besednjak, PhD, substitute chairman
- Vladimir Malenkovič, PhD, member
- Aljoša Tomaž, member
- Franc Rosec, member – representative of the workers
- Branko Sevčnikar, member – representative of the workers

Director:
The company is run and represented by the director, who is appointed by the supervisory board by tender for a four year term. After the mandate expires, the director may be reappointed. In accordance with the memorandum of association, the director does not have the jurisdiction to enter into transactions or adopt decisions regarding:
- entering into legal transactions and contracting loans higher than 333,834.08 EUR for the same object within the current year;
- disposal and pledging of properties and
- capital investments of the company in other legal entities.

The director of the company is mag . Simon TOT, who entered his term on 11.11.2010.

Committee for risks

Company has established a committee for risks, which monitors and evaluates all possible risks in the company. The committee is lead by Jaroslav Vrtačnik, MSc.

Trade union and workers' council

Trade union and workers' council are active in the company. Trade union is lead by Branko Sevčnikar and the workers' council by Janko Lihteneker.

3.1.4. NUMBER AND QUALIFICATION STRUCTURE OF EMPLOYEES

The Šoštanj Thermal Power Plant employs 460 workers. The number and qualification structure of employees by sector is as follows:

NUMBER AND QUALIFICATION STRUCTURE OF EMPLOYEES

Status on 31 December 2008

Level of education / Sector	I-III	IV	V	VI	VII	Total
Technology and maintenance	16	69	68	24	15	**192**
Operation	39	47	79	13	3	**181**
Economic sector	2	8	12	2	8	**32**

General HR	4	12	10	3	5	**34**
Staff duty	-	1	1	5	14	**21**
Total	**67**	**157**	**173**	**49**	**49**	**460**

3.2. POWER AND HEAT GENERATION AND FUEL CONSUMPTION

3.2.1. POWER GENERATION ON THE PRODUCTION THRESHOLD OF ŠTPP (GWh)

	2006	*2007*	*2008*	*2009*	*2010*
U 1–3	539.8	562.7	354.18	391.4	286.7
U4	1,399.5	1,600.5	1,499.7	1,215.2	1,489.5
U5	1,089.4	1,593.1	1,906.9	1,909.1	1,961.9
GT51			59.5	121.9	101.1
GT52			29.8	115.3	107.0
TOTAL	**3,748.7**	**3,756.3**	**3,850.0**	**3,753.0**	**3,946.3**

3.2.2. HEAT GENERATION (GWh)

	2006	*2007*	*2008*	*2009*	*2010*
TS1	71.1	73.3	34.0	29.3	58.8
TS2	354.2	326.0	374.8	359.4	348.3
TOTAL	**425.3**	**399.3**	**408.8**	**388.6**	**407.1**

Heat energy is produced for the use of district heating of Šaleška valley. Installed power of heating stations is 272 MW and the heat is supplied to approximately 33.000 households. The total length of the district heating system is more than 162 km.

3.2.3. COAL CONSUMPTION (000 t)[4]

	2006	*2007*	*2008*	*2009*	*2010*
U 1–3	672.6	707.3	455.2	500.5	364.2
U4	1429.8	1749.1	1634.0	1308.2	1542.9
U5	1889.5	1616.2	1948.5	2014.2	2044.3
TOTAL	**3991.9**	**4072.6**	**4037.7**	**3822.9**	**3951.4**

3.2.4. BIOMASS CONSUMPTION (000 t)

	2008
TOTAL B1-5	**86.1**

3.2.5. GAS CONSUMPTION (000 Sm^3)[5]

	2008	*2009*	*2010*
TOTAL	**26,058.1**	**68,992.0**	**60,874.9**

[4] The table shows coal consumption data for electric and thermal power

[5] Supplier of gas is the only possible supplier in Slovenia, Geoplin. TEŠ has a signed contract with Geoplin on the dynamics of sales by 2015.

3.3. INVESTOR'S OPERATING RESULT

3.3.1. INCOME AND EXPENDITURE ACCOUNT

in 000 EUR

Item / year	2010	2009	2008
Operating income	247,387	236,951	256,644
Financial income	11	194	293
Other income	64	200	3
TOTAL INCOME	**247,462**	**237,345**	**256,940**
Material expenses	154,614	157,292	153,737
Services	18,283	15,988	17,031
Depreciation	32,360	28,839	26,560
Labour costs	18,928	18,607	17,397
Provisions	382	542	306
Other business expenditure	16,203	14,022	17,540
Interest	1,246	1,907	3,891
Other financial expenditure	231	2	9
Other expenditure	30	2	245
TOTAL EXPENDITURE	**242,277**	**237,201**	**23,6716**
Deferred taxes	256	8	17
Income tax	1,239	97	2168
PROFIT	**4,202**	**55**	**18,039**

The operations of Šoštanj Thermal Power Plant are based on the Long-term contract on the purchase of coal, lease of power and purchase of electric power, signed by Termoelektrarna Šoštanj, Holding Slovenske elektrarne and Premogovnik Velenje coal mine in September 2004. The contract defines mutual relations for the period from 2005 to 2015. The contract defines basic and additional quantities of coal in GJ, which the Šoštanj Thermal Power Plant will purchase from the Premogovnik Velenje coal mine, while Holding Slovenske elektrarne, as a customer, will purchase all the energy generated in Šoštanj Thermal Power Plant at a price determined by an annual contract. In accordance with the long-term contract, Šoštanj Thermal Power Plant is purchasing coal for the production of power and heat from Premogovnik Velenje coal mine. The price of coal is also determined by annual contracts with Premogovnik Velenje coal mine.

In 2008, after the construction of gas turbines on Units 4 and 5, Šoštanj Thermal Power Plant used a new fuel – gas – for the first time, and electric power was also produced from biomass. All the electric power generated was sold to HSE in accordance with the long-term contract.

3.3.2. BALANCE SHEET

in 000 EUR

	2010	2009	2008
RESOURCES	**541,317**	**46,871**	**404,351**
Fixed assets	**478,424**	**405,865**	**319,861**
-intangible fixed assets	13,553	17,919	22,150
-tangible fixed assets	463,989	387,147	296,908
-long-term financial investments	60	214	213
-long-term operating receivables	130	149	162
-deferred taxes	692	436	428
Current assets	**57,006**	**58,948**	**73,737**
-assets held for sale	202	202	202
-stock	12,649	12,142	11,545
-short-term financial investments		1,761	0
-short-term operating receivables	44,107	44,840	61,942
-cash	48	3	48
Accruals and prepaid expenditure	**5,887**	**3,358**	**10,753**
LIABILITIES	**541,317**	**468,171**	**404,351**
Capital	**348,575**	**344,373**	**258,860**
Provisions and long-term accrued liabilities	**17,233**	**22,189**	**26,990**
Long-term liabilities	**23,472**	**33,749**	**44,026**
Short-term liabilities	**146,245**	**64,501**	**66,766**
Short-term accrued liabilities	**5,792**	**3,359**	**7,709**

In 2007 and 2008 the company's capital increased due to a capital injection and profit. Because the depreciation charge of fixed assets was not sufficient for new investments, long-term loans for investments were contracted from commercial banks in 2007. Long-term financial liabilities increased due to the contracting of new investment loans. The investments are reflected in the increase of the fixed assets value.

3.3.3. FIXED ASSETS VALUE

CURRENT FIXED ASSETS VALUE (status on 31 December 2010)

Item	Current value in 000 EUR	%	Depreciation rate	% of write-off
Land	3,712	0.80		
Equipment	193,655	41.74	1.3% - 47 %	81.4%
Structures	38,574	8.31	1.28% - 5%	81.4%
Investments in progress	157,659	33.98		
Advances given	70,389	15.17		
TOTAL	**463,989**	**100.00**		

3.3.4. INVESTOR’S LONG-TERM FINANCIAL LIABILITIES

Status on 31 December 2010

Year	*Principal*	*Interest*
2012	10273	861
2013	8331	401
2014	1389	164
2015	1389	110
2016	1389	56
2017	694	8
TOTAL	**23465**	**1600**

4. MARKET ANALYSIS, ANALYSIS OF MARKET OPPORTUNITIES, AND REASONS FOR THE INVESTMENT PROJECT

ŠTPP is the largest power plant in the HSE system and in the Slovenian electricity system (SES), by the annual amount of electricity produced as well as by installed power. From 2003 to 2010, the average annual production of the power plant has been over 3,700 GWh. With its average percentage of electricity generation in Slovenia reaching almost 35 per cent, ŠTPP is an important energy pillar of reliable electricity supply in Slovenia. Information on ŠTPP production units and ŠTPP production is given in Tables 4.1 and 4.2.

Table 4.1: Information on ŠTPP production units

Unit	*Installed power MW*	*Threshold power MW*	*Startup year*	*Intended shutdown year*
Unit 1 (shut down)	30	25	1956	2010
Unit 2 (shut down)	30	25	1960	2010
Unit 3	75	55	1960	2015
Unit 4	275	248	1972	2015
Unit 5	345	305	1977	2027
GT 5/1	42	41.9	2008	2027
GT 5/2	42	41.9	2008	2027
TOTAL	**839.0**	**741.8**		
TOTAL (excl. U1 and U2)	**779.0**	**691.8**		

Table 4.2: Electricity production in ŠTPP and percentage in Slovenia's production

Year	*ŠTPP production (GWh)*		*Production in Slovenia (GWh)*[6]	*% ŠTPP*
	generator	*threshold*		
2003	3,962	3,464	10,637[7]	32.6 %
2004	4,044	3,550	10,787	32.9 %
2005	4,139	3,641	10,483	34.7 %
2006	4,269	3,749	10,536	35.6 %
2007	4,268	3,756	10,422	36.0 %
2008	4,359	3,850	11,330	34.0 %
2009	4,244	3,753	11,703	32.1 %
2010	4,460	3,946	11,728	33.6 %

The power plant uses Velenje lignite as the primary fuel for generating electric energy. The average annual coal consumption between 2003 and 2010 was 4,100 thousand tons, consequentially burdening the atmosphere with carbon dioxide emissions. Due to environmental considerations and mostly due to Slovenia's commitment to the Kyoto Protocol, there have been significant pressures to reduce the consumption of coals in the process of obtaining final energy forms. While we want reliable domestic production of electricity on the one hand, we are, on the other hand, restricted by environmental requirements.

Recent projections have shown that the percentage of coal in the European energy industry is

6 Half of the production of Nuclear Power Station Krško is taken into account

7 The reciprocal agreement from 2003, transferring half of the ownership and production to HEP (Hrvatska elektroprivreda/Croatian electricity company), which came into force mid-April 2003, was taken into account.

decreasing; however, the recent accident at a nuclear power plant in Japan will likely cause an increase of the percentage of coal in future projections. In addition, statistical information shows that there has been an increase of electricity production in existing coal-fired power plants since the year 2000. The main reasons for this situation lie in the rapid increase of electricity consumption, a shortage of new production capacities and higher efficiency. Despite the tendencies for decreasing the use of coals in the EU, Germany, for example, remains the largest producer and energy system supplier of electric energy from this primary source.

4.1 PRODUCTION AND CONSUMPTION OF ELECTRICITY IN SLOVENIA

As seen in Table 4.3, the increase of the production of electricity in the years after gaining independence was lagging far behind the increase of the consumption, which put Slovenia in the position of being a net importer of electricity. The balance improved in 2009, mostly due to decreased economic activity and, consequentially, decreased energy consumption caused by the world financial and economic crisis. The improvement of the energy balance in 2009 can be attributed to, on the one hand, significantly lower consumption of large direct consumers, and on the other hand, favourable hydrology in that year and the consequential above average production of electricity in hydroelectric power plants. Consumption has gone up slightly in 2010 and we estimate that the trend will continue in the coming years along with the gradual recovery of the economy.

Table 4.3: Production and consumption of electricity in Slovenia

Year	***Production (GWh)***	***Consumption (GWh)***	***Balance (GWh)***
2003	10,637	12,365	-1,728
2004	10,787	12,671	-1,884
2005	10,483	13,064	-2,581
2006	10,536	13,375	-2,839
2007	10,422	13,507	-3,085
2008	11,330	12,798	-1,468
2009	11,703	11,426	+0,277
2010	11,728	12,355	-0,627

Like the consumption, the peak consumption had also increased in pre-recession times in Slovenia, which is seen in Table 4.4. It reached its maximum in 2007 in accordance with the increasing trend of electricity consumption, and it also decreased with the beginning of the recession. We expect that the peak consumption will increase in the following years, considering the expected increase of consumption, which will increase the need to provide power for the requirements of the Slovenian market.

Table 4.4: Trends of peak demand in Slovenia

Year	*Peak value (MW)*	*Date*	*Time*	*Day of the week*
2003	*1,923*	*11 Dec*	*6 pm*	*Thursday*
2004	*1,991*	*14 Dec*	*7 pm*	*Tuesday*
2005	*2,043*	*24 Nov*	*7 pm*	*Thursday*
2006	*2,075*	*26 Jan*	*7 pm*	*Thursday*
2007	*2,060*	*19 Dec*	*7 pm*	*Wednesday*
2008	*1,963*	*10 Jan*	*7 pm*	*Thursday*
2009	*1,912*	*17 Dec*	*6 pm*	*Thursday*
2010	*1,940*	*16 Dec*	*6 pm*	*Thursday*

The map below shows the electric power balance of some European countries in 2010. If we begin in the West, we notice that Spain, France and Germany have a markedly positive energy balance, which can be attributed to a great number of production facilities. Most electric power in France is generated in nuclear power plants, while Germany produces a large proportion of electricity in coal-fired power plants as well as nuclear power plants. In Italy, a longtime net importer of electric power, most of the power is generated in gas power plants, which is also reflected in the high energy prices in this country. Slovenia is exploiting this fact by trying to use its geostrategic position to profit from the electric power price differences in Italy and the countries of SE Europe. Former Yugoslavian countries, except Slovenia, are still not included in emission credit trading, which lowers their environmental standard and thus enables the production of electric power at a lower cost. We can expect that these countries will also have to join the trading scheme and adapt to EU legislation in case trading with all emission allowances in the EU is implemented, which will consequentially increase their cost price. Romania and Bulgaria should also be highlighted as important exporters of electric power in SE Europe, as they largely cover the minuses in the energy balance of other European countries.

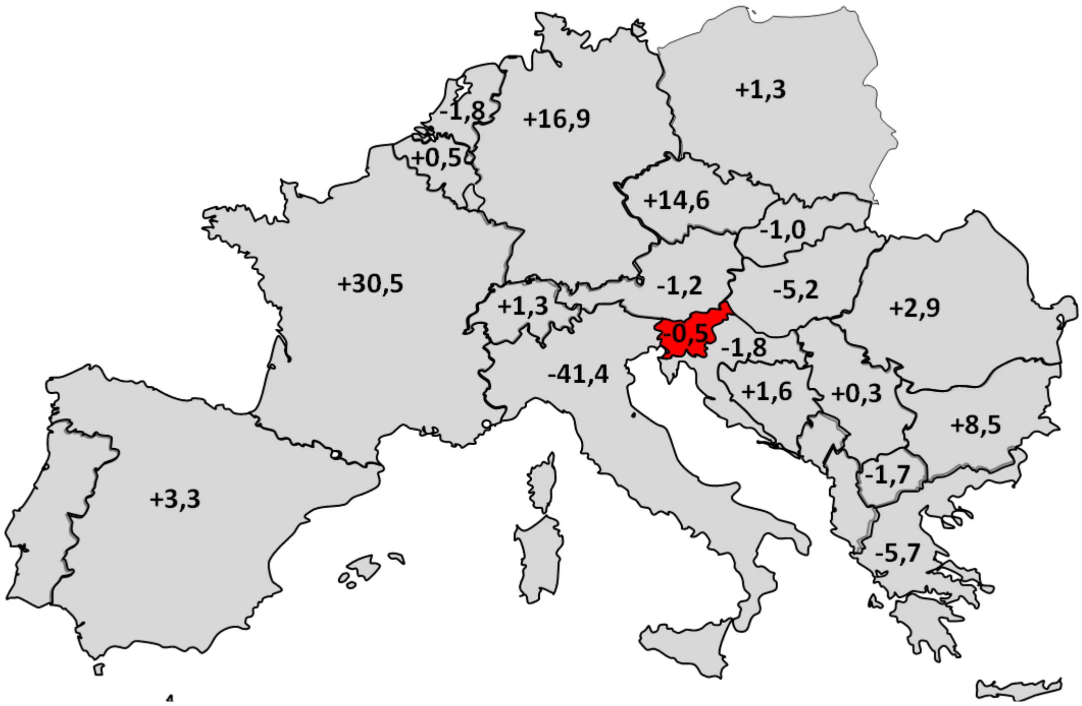


Image 4.1: Energy balance of European countries in 2010
**data for Italy, Belgium, and Switzerland only up to and including the month of November*

Current and future trends in Europe and the world predict the construction of large-scale base load plants with installed power up to over 1000 MW per unit (contemporary and more environmentally friendly fossil fuel units, planned nuclear programme etc.), utilizing the philosophy of economy of scale. Accelerated construction of new capacities will require substantial investment funds, and new power plants will be built only on the condition of economic success, which means that the market price will need to cover all their costs.

For Slovenia as a net importer of electricity, it makes sense to prospect for optimal technical and economic development solutions. The goal of electricity production is transforming primary energy forms into electric energy with maximum efficiency and consequential reduction of specific fuel consumption per MWh of electric power and reduction of greenhouse gas emissions and other harmful effects on the environment. The recent development of thermal units allows for new solutions, which are optimal for replacing the existing units of ŠTPP. This is a solution where a new higher efficiency unit increases the overall efficiency of the Šoštanj TPP and at the same time decreases the specific environmental CO_2 impact.

The following goals will be accomplished with the construction of Unit 6 in the Šoštanj TPP:

- Maintaining the electricity production in ŠTPP by using domestic coal
- Electricity production of ca. 3,500 GWh with a ca. 30 % lower consumption of coal[8]
- Decreasing the emission factor (kg CO2 / kWh) from 1.25 to 0.87
- Decreasing the cost price of electricity by more than 20 EUR/MWh
- Achieving a return on equity of at least 10 %
- Ensuring the continued existence of the energy sector in Šaleška Valley in collaboration with Premogovnik Velenje coal mine
- Fulfilling the EU climate commitments
- Achieving an internal rate of return (IRR) of over 7 %

Before the construction of the new 600 MW unit in Šoštanj, Unit 3 will be shut down after approximately five decades of operation, while Units 1 and 2 have already been shut down. The new Unit 6 will also replace Unit 4 and Unit 5, although Unit 5 will remain as cold reserve and will operate according to the requirements of the system, but only up to a maximum output of 1,055 GWh. The bulk of the power generated by Unit 6 will be sold on the domestic market, while we will optimize the production portfolio by importing and exporting electric energy across Slovenia's borders, as we are already doing now.

The wholesale price on the electricity market is set by the last sold "threshold" MW of energy in a certain hour. According to the expected energy balance of Slovenia in the coming years, when it is expected that Slovenia will remain a net importer of electricity despite the recession, the price in Slovenia will be dictated by the continental European market due to good cross-border transmission capacities. The technical potential of Unit 6 will permit flexible operation, which means that the sales price achieved will be above the base load price. According to the analysis conducted, the sales price would be 6 or 7 % above the base load price.

4.2 ANCILLARY SERVICES MARKET

Electricity is an atypical commodity, as it cannot be stored, except in relatively small quantities, and it therefore needs to be produced practically at the same moment that the need for it arises. Electricity is transmitted via electricity power networks which have to comply with numerous, particularly technical conditions, such as maintaining the same frequency between networks, maintaining adequate voltage conditions, maintaining sufficient reserves to cover unpredictable outages of production units etc., in order to make transmission actually possible. It is therefore necessary to monitor and manage electricity transmission over networks in real time, which is a task for electricity transmission system operators (ETSO). The resources that the electricity transmission system operators must have at their disposal for this purpose are called ancillary services. They must be ensured, also financially, by all electricity network users by paying network charges. The most important ancillary service that ŠTPP provides within the ES of Slovenia for the ETSO system operator and that will be ensured in the future by the new Unit 6 is secondary control reserve. In order to understand the importance of Unit 6 ŠTPP,

[8] The reduction is foreseen in accordance with the weighted average efficiency of existing ŠTPP production units (Unit 3, 4 and 5), which is between 32.5 and 33.0 %. Compared to Unit 6, which has a maximum efficiency of 43 %, this represents a ca. 30 % reduction.

it is necessary to provide a more detailed description of the significance of system reserves.

System reserves
According to the UCTE electricity network methodology, which also includes the ES of Slovenia, we can distinguish primary, secondary and tertiary control.

Primary control is automatic control of the inflow of the operating resource on the turbine (water in hydroelectric power plants, superheated steam on turbines in coal-fired thermal power plants, natural gas or fuel oil) according to the change in the network frequency. Production facilities have such primary controls and they may not be blocked. Primary control is incredibly fast, as it functions in a few seconds or in up to 15 seconds. If the system frequency deviation is small, the primary control in production units stabilizes the frequency on its own.

Secondary control is managed from the electricity transmission system operator centre according to the state of the system frequency and according to flow deviations at the limits of the observed network. It sets in after the primary control action and restores the system frequency to the nominal value of 50 Hz in 15 s to 15 min. Due to the short time in which it must be carried out, only some hydroelectric power plants and some operating thermal power plants can provide it (which is why it is also called hot reserve). Activating the secondary control allows for the primary controls to return to their reference state.

Tertiary control is also managed from the electricity transmission system operator centre. The time interval of triggering is the longest here, as the control sets in within 15 minutes or more. Tertiary or also minute control can be used during unplanned outages in larger production units (lasting several hours or even several days), when new production capacities are needed for the re-equalization of production and consumption and consequential restoration of the system frequency to the nominal value. Activating the tertiary control allows for the secondary controls to return to their reference state, or more precisely, it provides additional production sources which allow for a more economical allocation of secondary control reserves within the system.

Triggering of the primary, secondary and tertiary control generally follows the just-mentioned sequence. Activation of the secondary control reserve releases the primary control reserve, and activation of the tertiary control reserve releases the secondary control reserve (or allows for its more economical allocation among the production facilities). Therefore, the electricity transmission system operator must have the required volume of secondary control reserves at its disposal at all times.

The (domestic) production units themselves are obliged to ensure primary control reserves, while the secondary and tertiary control reserves must be ensured by the electricity transmission system operator. Tertiary control reserves can also be partially contractually purchased from import (from other electricity systems), while the secondary control reserve can only be provided within the domestic system.

Secondary control reserve market
It is only possible to trade electricity when ancillary services have already been secured. The electricity transmission system operator provides the ancillary services. Even in the liberalized electricity market the transmission system largely remains a monopolistic activity of the state, but it is conditionally possible to speak about an ancillary services market.

The manner in which secondary control reserves are provided in Slovenia is defined in the System operating instructions which are in accordance with UCTE instructions. There is only one buyer on Slovenia's secondary control reserve market, ETSO, which has the right to request of those domestic production units that have the required technological qualifications for it to cooperate in providing secondary control reserves. Commercial contracts for the purchase of secondary control reserves are concluded with the selected enterprises. Thermal and some hydroelectric power plants, especially the chain of hydroelectric plants on Drava, provide secondary control reserves in Slovenia. Because ETSO must ensure secondary control reserves in any given moment, the ŠTPP units are of greater value than hydroelectric plants and pumped-storage plants as the contribution of the latter still depends on the current flow rates in the river basins.

4.2.1 REQUIREMENTS AND PROVISION OF SIGNIFICANT ANCILLARY SERVICES IN UNIT 6 ŠTPP

The electricity system must operate reliably in all operating conditions regardless of restrictions. The electricity transmission system operator is in charge of ensuring reliable and quality supply of electricity. He uses the following ancillary services provided by power plants to ensure reliable operation of the electricity system:

- Frequency and power regulation (primary, secondary, and tertiary)
- Voltage regulation
- Covering deviations of actual exchanges in the control areas from the planned values
- Generator start up without an external power supply
- Covering losses incurred in the transmission network
- Unburdening the network

System reserves have an important role in the event of disturbances in the system. There must be a sufficient power reserve in the electricity system at all times for the needs of the primary, secondary and tertiary frequency control, which must be provided by the electricity transmission system operator. The power reserve for frequency control is intended to provide a balance between the production and consumption of electricity in the electricity system.

The bulk of the ancillary services is provided by operational production units which mostly operate within the area covered by the system operator.

Coal-fired units in ŠTPP are already an important pillar of power reserves in the electricity system, especially Units 4 and 5. In addition to other services, the units are also included in the automatic secondary frequency and power control and therefore provide the system with the most significant share of these powers. When the old units are shut down, the new unit, Unit 6 ŠTPP, will be required to take over their load.

4.2.1.1 ENSURING RESERVE POWER FOR PRIMARY FREQUENCY AND POWER CONTROL IN UNIT 6 ŠTPP

The cooperation of every unit in providing reserve power for primary control is obligatory in accordance with the System operating instructions for the transmission network.

In accordance with ENTSO-E regulations, the system operator must provide power for correcting imbalances (consumption-generation) which is proportional to the frequency deviation.

The maximum available primary control range must be activated in a quasi-stationary frequency deviation of 200 mHz.

The primary control reserve must be available within 15 seconds, while reserve power must be available 15 minutes after activation.

The minimum primary control range must be at least ± 2 % of the generator's rated power. On the other hand, it is required to set the turbine controller static in thermal power plants at 6 %, which is the maximum range necessary.

Table 4.5 shows the range of reserve power of Unit 6 ŠTPP needed for primary frequency-power control.

Table 4.5: Reserve power range for primary control of Unit 6 ŠTPP

Unit	Minimum range of reserve power for primary control (MW)	Maximum range of reserve power for primary control (MW)
Unit 6 ŠTPP	±11	±37

4.2.1.2 COOPERATION OF UNIT 6 ŠTPP IN PROVIDING RESERVE POWER FOR SECONDARY FREQUENCY AND POWER CONTROL

Providing reserve power for secondary control is a commercial category.
Secondary control is responsible for the autonomy of the electricity systems connected into the UCTE interconnection. Autonomy can be achieved by eliminating discrepancies between production and consumption in the system that caused the balance. The frequency deviation is thereby eliminated (effect of the static) due to the primary control, power transfers on interconnections are returned to the agreed values, and the primary control reserve range is released again. Secondary frequency control must be activated within 30 seconds and completed in no later than 15 minutes.

In terms of participation in secondary control, power plants differ according to:
- Amount of reserve power
- Speed of response in secondary control

It is optimal in mixed hydro-thermal systems that control needs are covered by the hydroelectric plants. In Slovenia, their ability to do so is limited by flow accumulation and hydrological conditions. This means that the control load must be taken on by the thermal plants as well, especially the plants that have the skills and technological qualifications for such tasks. In ŠTPP this means Units 4 and 5. These two units cover up to 50 % of the required reserve power for secondary control in the electricity system of Slovenia.

After the existing units are shut down or their production volume is decreased, Unit 6 will take on the task of cooperating in the automatic secondary frequency control. The Unit's technological and technical design is adequate and will be able to ensure appropriate time power increments – gradients by optimising vital assemblies.

Table 4.6 shows the maximum contribution of Unit 6 to providing system reserves for secondary control.

Table 4.6: Maximum contribution of Unit 6 ŠTPP to providing system reserves for secondary control

Unit	Maximum reserve power range for secondary control (MW)
Unit 6 ŠTPP	±45

4.2.1.3 RESERVE POWER FOR TERTIARY CONTROL AND MINUTE RESERVE

Tertiary control of active power or minute reserve is intended for covering the reserve power for secondary control and must be activated within 15 minutes. This means that in our circumstances, primarily only fast gas turbines, pumped-storage plants and, conditionally, other operational units can provide it.
It is not planned for Unit 6 to provide minute reserve for the system.

4.2.1.4 OTHER ANCILLARY SERVICES

In addition to already described tasks, Unit 6 of ŠTPP will also perform important tasks in ensuring primary, secondary and tertiary reactive power regulation at the level of the 400 kV network, and thus allowing the suitability of the voltage profile for transmitting power between systems.

<u>4.3 MARKET SITUATION ANALYSIS IN TERMS OF THE INVESTMENT</u>

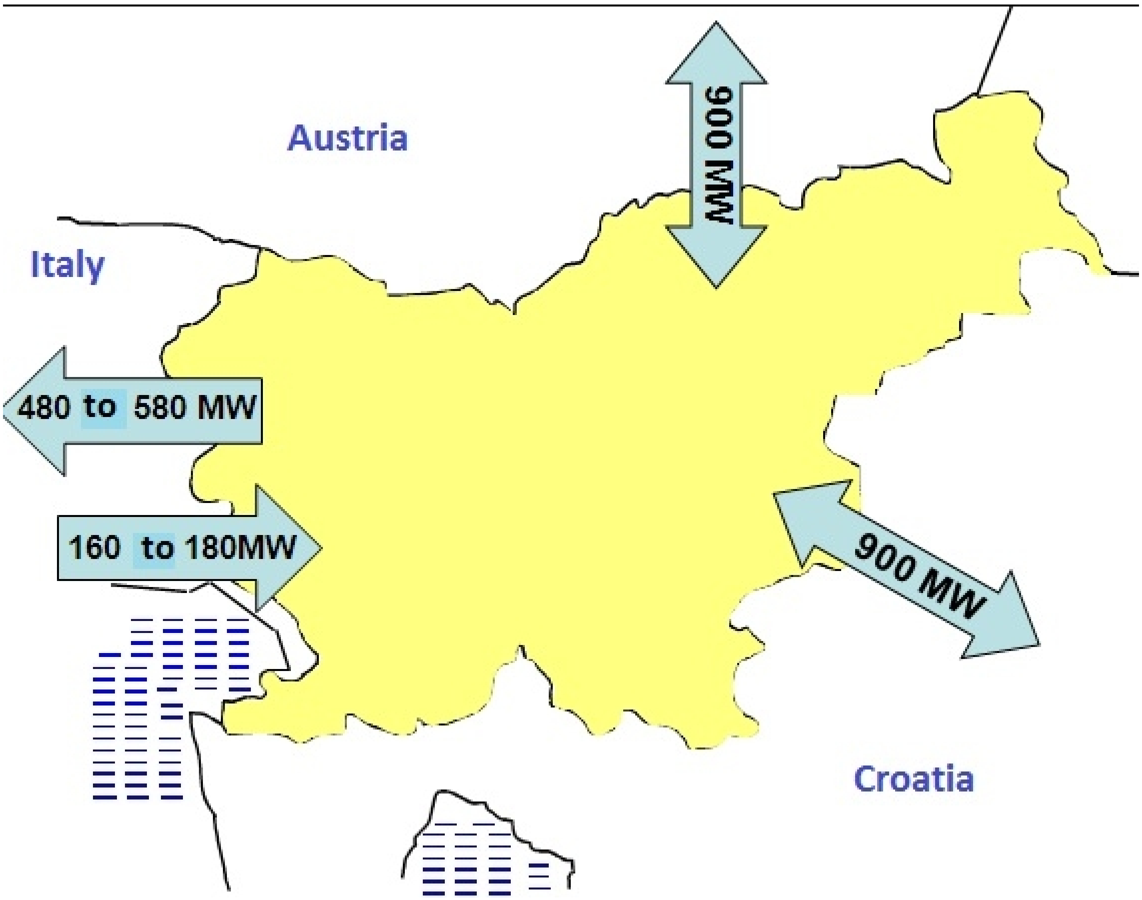


Image 4.2: Cross-border transfer capacity

The Slovenian wholesale electricity market is well connected to neighbouring markets and through them to other European markets. According to the values of the cross-border transfer capacity, it is possible to import 900 MW of power from Austria, 900 MW from Croatia, and 180 MW from Italy, amounting to 1980 MW. This suggests that the market is subject to a competitive situation, and that the price on the Slovenian wholesale market is determined by electricity prices in neighbouring markets.

In terms of the values of cross-border transfer capacity given in image 4.3, it is possible to export 7.9 TWh to Austria, 7.9 TWh to Croatia, and 4.2 TWh to Italy, a total of 20 TWh of energy.

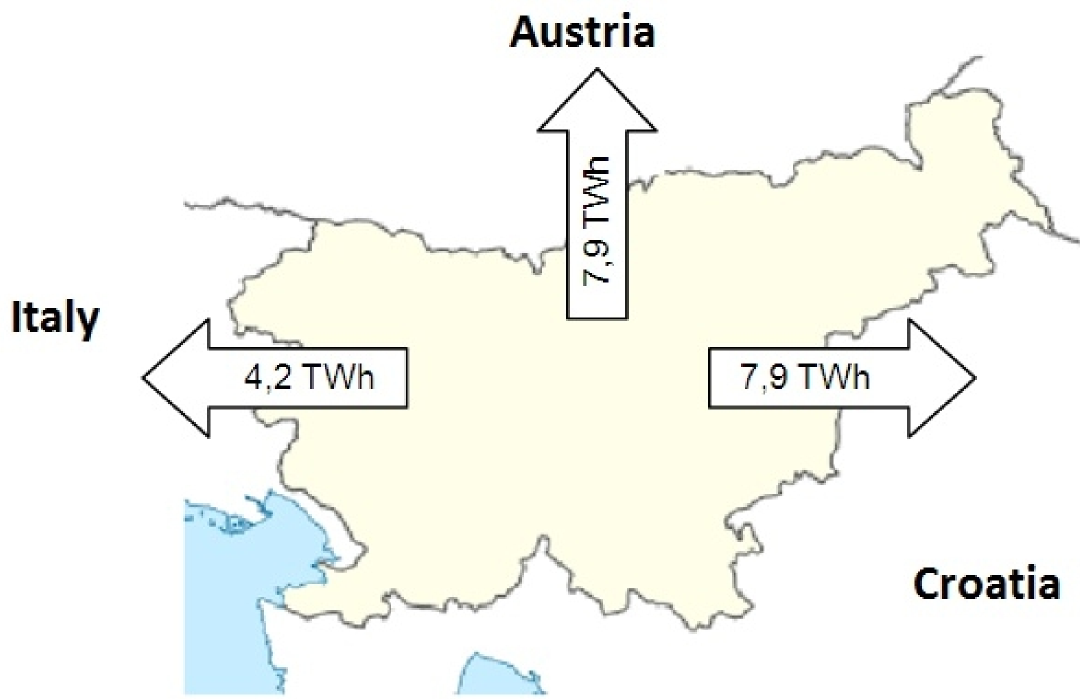


Image 4.3: NTC values on Slovenia's borders

The size of the electricity market in which Slovenian producers can place their production equals the consumption in Slovenia and the possible export to neighbouring markets. Considering that Units 3 and 4 will be shut down when Unit 6 becomes operational, Unit 6 will in reality only replace the existing units which will have been shut down. With Slovenia's current negative electricity balance and high NTC values on the borders for exporting electricity to neighbouring markets, placement of the volume of electricity produced in Unit 6 will not present a problem neither in terms of quantity nor in terms of power.

Due to Slovenia's good connections with European markets, the most liquid electricity market in Europe, the EEX in Germany, will play the main role in determining the wholesale price of electricity in Slovenia. In addition to trading for a day in advance, standardised futures contracts for the supply of electricity are also traded at the EEX. The movement of prices of these futures contracts shapes the actual production and consumption of electricity – the main factors in determining the price on the daily market, as well as the movement of prices of primary energy sources (oil, gas, coal) and CO_2 credits, the correlation of which with electricity supply contracts changes through time and price ranges.

4.4 MOVEMENT OF PRICES OF PRIMARY ENERGY SOURCES COMPARED TO THE PRICES OF ELECTRICITY

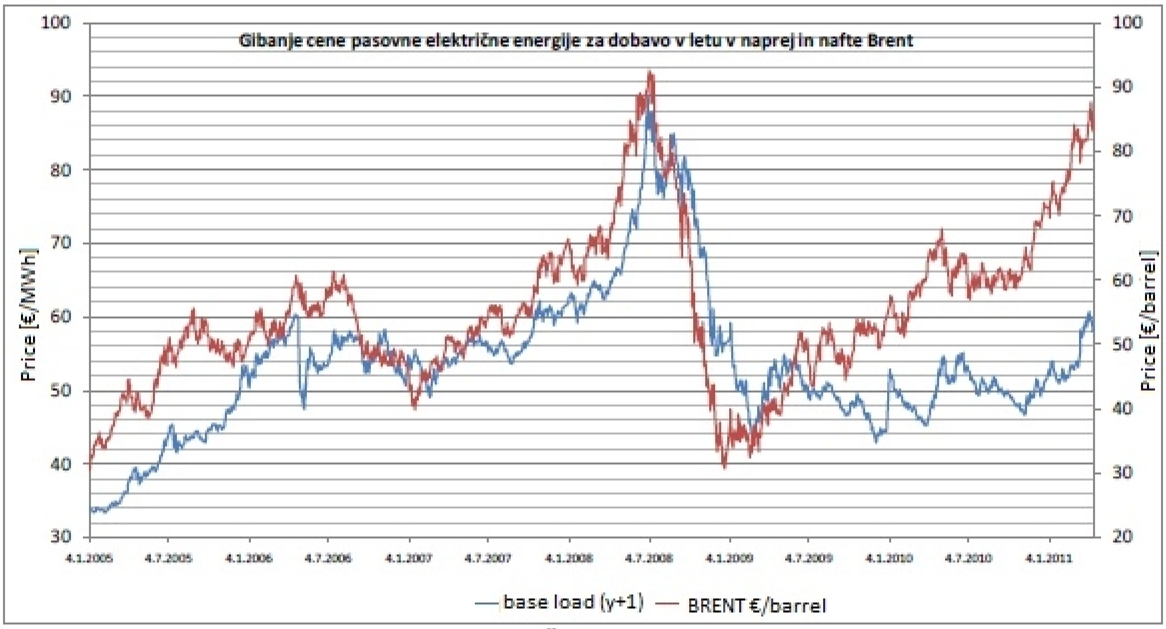


Image 4.4: Movement of base load electricity prices for supply in the year ahead and Brent crude oil

In 2005, when the prices of energy sources increased due to the apparent escalation of the situation with the US, the world's largest consumer of oil, and the war in Iraq, futures contracts for the supply of electricity increased accordingly. The prices continued to rise, especially in the beginning of 2008, when the global economic cycle was still in GDP growth and the price of oil increased rapidly due to a fast consumption increase in China, India and Brazil, and an influx of investors' speculative purchases of futures contracts for the supply of oil. Soon after the extent of the greatest world economic crisis since 1929 began to show, the price of oil plummeted to around 40 $ per barrel, and the price of futures contracts for the supply of electricity quickly followed.

Looking at the present situation, with the price of oil moving very close to the highest prices in 2008 due to the turbulent situation in the Middle East, while the price of electricity has recovered much less, we can see a large current gap between the two curves. Given the movement of the two curves in the past, we can expect the two curves to come closer in the future.

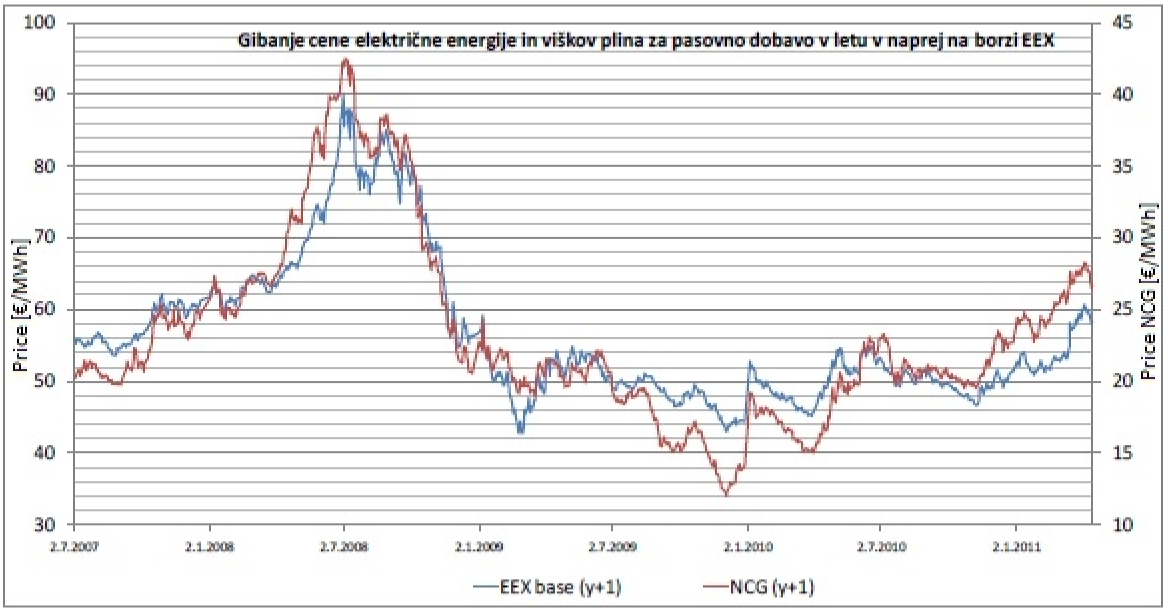


Image 4.5: Movement of electricity prices and the surplus of gas for base load supply in the year ahead

Similar to the price of oil, the price of surplus gas in Germany (Net Connect Germany) reached a peak in June 2008 when it amounted to around 42 €/MWh. The NCG price of gas plummeted in the second half of the year due to a large decrease of industrial consumption. In 2009 and in the beginning of 2010, there was still a large surplus of gas in Europe due to the economic slowdown, and the falling prices of the surplus also greatly affected the decrease of the prices of long-term electricity supply contracts. In spring 2010, the demand to supply ratio in the market stabilized and the prices of gas began to move in greater correlation with the oil prices again. The prices of oil, as seen in the previous chart, were already significantly higher in early 2010 than at the peak of the economic crisis. Due to the fact that the correlation between the price of oil and gas is historically very high, and due to the recent significant increase of oil prices, the gas prices followed that trend in the last six months. Thus, the price of surplus gas, not unlike the price of oil, has recently increased faster than the price of electricity.

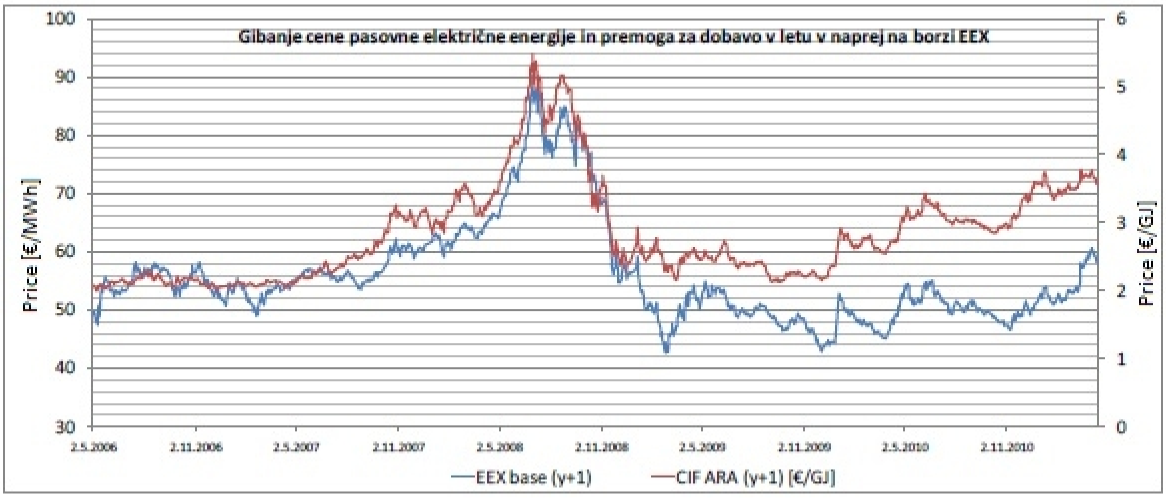


Image 4.6: Movement of base load electricity prices and coal for supply in the year ahead

The price of coal, similar to other primary energy sources, reached its peak (5.5 €/GJ) in the summer of 2008 and then fell to the value from 2006 in the next few months. China's and India's demand for coal has the strongest influence on the formation of coal prices in the world markets, as they use as much as around 60 % of the annual consumption of coal, while the consumption of EU countries amounts to around 15 % of world consumption. The economies of China and India have survived the global economic crisis almost without a scratch and their demand for coal is still growing. Prices in the market are shaped accordingly and they have been growing constantly since early 2009. The reason for the slightly faster increase since autumn 2010 can also be attributed to a disturbance on the supply end of the coal market, as events such as floods in Australia and strong monsoon rains in Indonesia affected the decrease of the production of coal.

4.5 EMISSION ALLOWANCE MARKET

The EU emissions trading scheme (ETS), which came into force in 2005, is one of the largest multinational emissions trading schemes in the world and it is a part of an extensive plan for reducing greenhouse gas emissions in EU member states. ETS brings together over 12,000 facilities that operate on fossil fuels and emit greenhouse gases into the atmosphere. The large emitters included in the ETS are obliged to perform regular measurements and report on actual emissions and to annually surrender emission allowances in an amount corresponding with the actual gas emissions into the atmosphere. For every ton of carbon dioxide emitted into the atmosphere, the polluter must surrender one emission allowance to the state.

The scheme includes companies from the energy sector, which are considered the largest polluters, as well as companies from other industries that also contribute a significant part of emissions (companies from the steel and chemical industry, paper mills and cement plants). In the first or so-called pre-Kyoto period between 2005 and 2007, countries allocated emission allowances free of charge. In the second or so-called Kyoto period, which is in force from 2008 until 2012, emission allowances are also given for free, but in significantly lower quantities than in the first period. In the third or post-Kyoto period from 2013 until 2020, the industry sector will still receive part of the allowances free of charge, while energy companies (with exceptions in some countries) will have to purchase the entire quantity at auctions.

A limited number of emission allowances issued within the ETS and the possibility of trading them results in this mechanism achieving a reduction of emissions where it is economically most efficient. By implementing the trading scheme, an important new factor has appeared in the electricity market, fundamentally changing the mode of providing electricity produced from fossil fuels.

Quantities of allocated emissions and emissions emitted into the atmosphere
The supply of emission allowances is determined by national emission credit allocation plans for each trading period of each member state. These plans determine the extent of allocation within each member state, while the demand is directly related to the industry production volume and consequentially the production in the energy sector. The electricity and heat production sector has continuously been the most important player on the demand side, which indirectly determines the dynamics in the emissions market. The quantities of verified carbon dioxide emissions into the atmosphere in 2009 given in Table 4.7 substantiate the important role of the energy sector in this market, as the emissions from this sector present over 73 per cent of total emissions. A relatively high percentage of the energy sector in 2009 is partially the consequence of the financial and economic crisis, as the recession was more evident in the iron and construction industry than in the energy sector. According to the forecasts of the analytical department of Deutsche Bank, the percentage of emissions from the energy sector will be a little over 72 per cent in 2010.

Table 4.7: Quantities of verified emissions in 2009

CO_2 emissions	2009 (Mt CO_2)	2009 (%)
Electricity and heat production	1377	73.5

Steel, iron industry	96	5.1
Cement industry	151	8.1
Refineries	146	7.8
Paper industry	28	1.5
Other	75	4.0
TOTAL	**1873**	**100**

Each year in early April, indicative information on actual greenhouse gas emissions into the atmosphere is published for each state. Table 4.8 provides data on emissions within the ETS in recent years, which show an evident surplus of allowances in the first period, while there was a shortage of allowances in the first year of the second period. The surplus of allowances in 2009 can be attributed to the recession. The numbers given for 2010 are only estimates, as some states have not yet reported the final data on greenhouse gas emissions.

Table 4.8: Allocated and verified emissions from 2005 to 2010

National allocation plans and verified emissions (Mt CO_2)				
Period	**Year**	**Allocation**	**Actual emissions**	**Surplus/Deficiency**
I. Period	2005	2096	2014	82
	2006	2071	2035	36
	2007	2153	2164	-11
II. Period	2008	1956	2199	-163
	2009	1966	1873	93
	2010*	1990	1948	42

With the current state of the economy, when the recovery of the European economy is still relatively unstable, it is quite difficult to predict the final emissions balance. It is however true that any additional emissions will easily be covered with emission allowances stemming from flexible Kyoto mechanisms, such as the Clean Development Mechanism (CDM) and Joint Implementation (JI), which generate units Certified Emission Reduction (CER) and Emission Reduction Unit (ERU). Estimates on the total quantity of CER allowances issued in the second period reach around 830 Mt, while 205 Mt of ERU allowances are reported to have been issued in the same period.

Emission Allowance Market

By limiting the quantity of emission allowances allocated within the ETS to a quantity which is lower than the foreseen demand, conditions are set that insure that these allowances have a value, a price. There are several factors in the Cap and Trade system that influence the price of emission allowances, but they can essentially be divided into short-term and long-term factors. Considering that the energy sector is the dominant user of emission allowances, the influential factors are strongly related to the production and consumption of electricity. Temperature, hydrological conditions, the extent of electricity production from renewable sources, prices of primary energy sources, and supply of emission allowances arising from the flexible Kyoto mechanisms can be considered short-term factors. Long-term factors include macroeconomic indicators, legislation framework changes, technological progress and modernisation of European production facilities.

The value of emission allowances has a major impact on business decisions of economic operators. Fluctuations in the prices of emission allowances change the variable costs of power plants and force the plant operators to adapt to the market conditions. Investors require long-term stability and predictability of the price of emission allowances, as they need a clear and reliable assessment of such costs in order to prepare calculations and adopt decisions on entering into new investments.

Emission allowances can be traded on special trading platforms (OTC market), or in a more organised manner taking place on various exchanges. The purpose of both markets is to bring together as many buyers and sellers as possible in one place. Considering that trading emission allowances on the OTC market presents a certain credit risk and risk of non-delivery, exchanges provide an alternative, less risky way of trading. By trading through the exchange we avoid a credit risk, because a clearing house steps between the buyer and seller and guarantees the consistent implementation of each transaction. The most important emission allowance exchanges include European Climate Exchange (ECX), Bluenext, European Energy Exchange (EEX) and Nordpool. Bluenext Paris where the majority of trading is daily trading (with immediate payment in cash) and ECX London which trades in futures contracts are the only two that are truly liquid.

Conditions on the Emissions Market

In addition to the energy sector, steel, chemical, and construction industry present the largest pollutants. Due to the fact that these sectors are more susceptible to economic fluctuations, the extent of economic activity in these sectors has decreased significantly after the recession set in, and many companies have had a surplus of emission allowances. In most cases, the allowances were sold on the market, creating a positive cash flow in the companies and slightly rectifying their annual business accounts. The most recent estimates of emissions show that production activities have increased significantly in all sectors in 2010, especially in the steel industry.

Energy companies in some less developed states within the ETS will have the right to free allocation of emission allowances in the third period, from 2013 to 2020, in order to prevent a rapid increase of household electricity prices and to facilitate the local energy sector's transition towards environmentally more friendly technologies. The states that meet the required criteria for this exception are Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland and Romania. The quantity of free emission allowances in 2013 may not exceed 70 per cent of total emissions required to cover the electricity production for domestic consumers, and the percentage must gradually reduce to zero by 2020.

Purchases in the Energy Sector for the Period after 2012

Energy companies that will not be allocated free allowances for their requirements after 2012 are purchasing allowances in accordance with electricity sales dynamics. Since allowance auctions by member states are not to be expected for some time, the energy sector is buying allowances from the current sellers, which are mainly from the industry sector. Thus, the purchases of the energy sector for its requirements after 2012 support the current prices of emission allowances.

Price of Emission Allowances

Image 4.7 shows the movements of electricity prices for the year ahead at the EEX exchange and spot prices of emission allowances on the Bluenext exchange since the start of the quotation in June 2005 until today. With the exception of the second half of 2006 and 2007, there has always been a strong positive correlation between the two products.

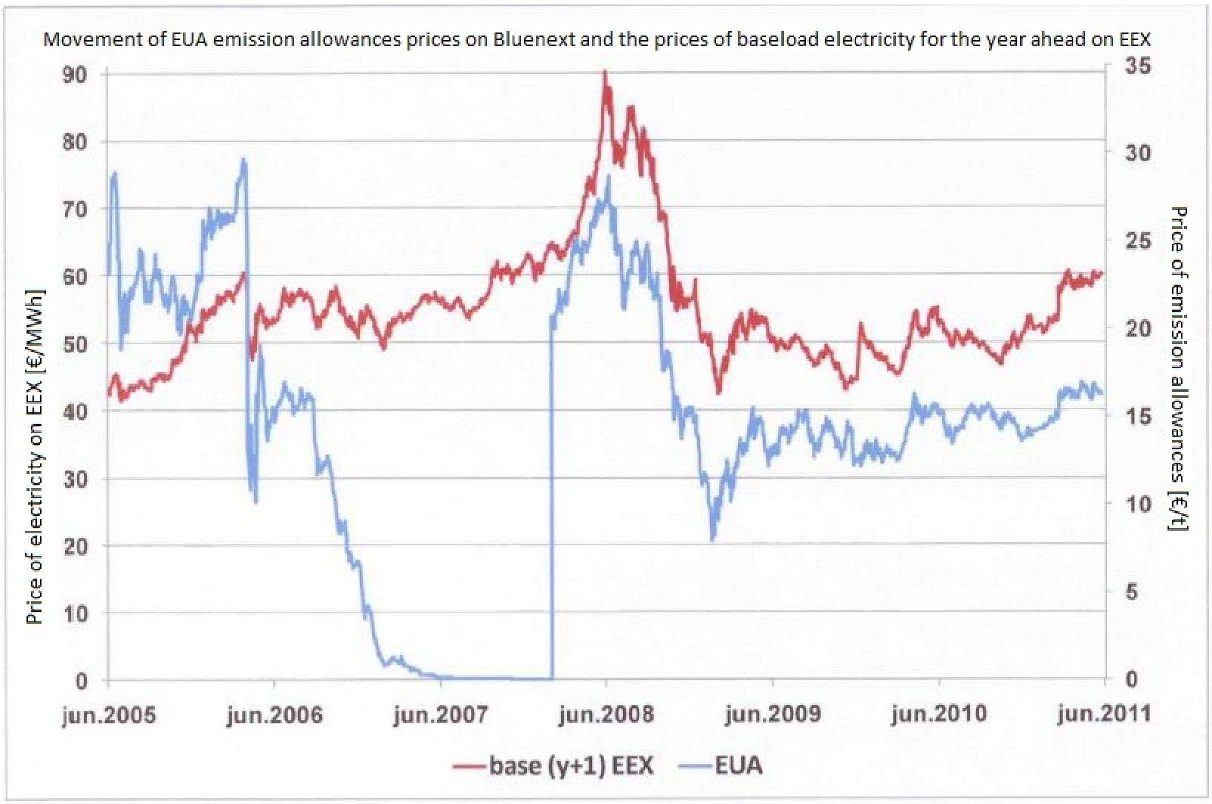


Image 4.7: Movement of the prices of emission allowances and the prices of electricity

In the pre-Kyoto period, prices went through several radical movements. The first rapid drop of prices occurred in 2006, when they first published the data on actual emissions within the scheme for 2005, which showed that there was a substantial surplus of allowances. Because ETS regulations did not allow the transfer of allowances from the first to the second period, the price drop was inevitable. With the favourable economic situation in the months after the information was published, the price recovered slightly, but as it became perfectly clear in the last year of the pre-Kyoto period that there was a surplus of allocated allowances, the latter were completely devaluated and their price plummeted to 0.01 €.

Considering the fact that it will be possible to transfer the allowances from the current period (2008 – 2012) to the next period (so-called "banking"), it makes no sense to expect that the price will collapse as in the first period, despite the current substantial surplus of allowances. However, after reaching its highest price close to 29 €/t mid-2008, the price of allowances began to drop rapidly after the start of the financial and economic crisis.

The price of electricity moves in accordance with the price of allowances, because producers are only prepared to sell an additional MWh if they can cover all variable costs, that is fuel costs and, since the European Trading Scheme came into force, costs of purchasing emission allowances.

The recent natural disaster in Japan and severe problems at the Fukushima nuclear plant caused a wave of shutdowns and "stress test" announcements in nuclear power plants all over Europe, causing another increase of the price of emission allowances. In the event that the production of electricity in nuclear plants decreases significantly, at least part of the lacking energy will need to be produced in fossil fuel plants, which will result in greater greenhouse gas emissions.

Predictions of Future Prices of Emission Allowances

Despite the fact that the scheme presents an additional burden on the industry in already harsh economic conditions, European politicians are clearly determined to continue with the planned path to a low-carbon society. In 2012, the aviation sector will join the scheme, which will increase the liquidity of the allowance market even further.

The current conditions in the industry and energy sector predict a period of higher emission allowance price volatility than we have experienced in the past two years. Regardless of the outcome of the accident in Japanese power plant Fukushima, it is clear that some of Europe's older nuclear power stations will have to be shut down, and that the idea of a nuclear energy renaissance in Europe will dissipate for a while. Investment bankers' forecasts show that this will be one of the reasons due to which we can expect higher prices of emission allowances in the future and, consequentially, higher prices of electricity.

4.5.1 GEOLOGICAL STORAGE OF CO_2

Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide supplements Article 9/a of Directive 2001/80/EC with the following content:

Operators of all combustion plants with a rated electrical output of 300 MW or more, for which the original construction licence (or, in the absence of such a procedure, the original operating licence) was granted after the entry into force of Directive 2009/31/EC, must assess if:

- suitable storage sites for CO_2 storage are available
- transport facilities are technically and economically feasible
- it is technically and economically feasible to retrofit for CO_2 capture

If these conditions are met, the competent national authority shall issue a guarantee that the thermal power plant possesses adequate space for subsequent retrofitting with equipment for capturing and compressing CO_2.

Šoštanj Thermal Power Plant, TE-TOL Ljubljana, Premogovnik Velenje coal mine, Trbovlje Thermal Power Plant, HSE, the Ministry of the Economy and the Ministry of the Environment and Spatial Planning have created the project ZETePO (Reducing Greenhouse Gas Emissions in the Post-Kyoto Period). Two terms of reference have been elaborated within the project so far, and the third one is underway. To date, the following studies have been made under HSE:

- "Coal consumption and CO_2 emissions in ŠTPP in 1986" (HSE, March 2004);
- "Effect of the variants of greenhouse gas allowance allocation in the period 2008 – 2012 on the operation of companies in the composition of HSE" (Electric power research institute Milan Vidmar, March 2006);
- "Support for obtaining emission allowances for the period 2008 – 2012 and integration of flexible mechanisms into HSE's commercial practice" (Electric power research institute Milan Vidmar, January 2007);
- "Analysis of operation variants and technological upgrading in terms of greenhouse gas emissions and nitrogen oxides in Trbovlje TPP in the composition of HSE" (Electric power research institute Milan Vidmar, November 2007);
- "CO_2 capture and storage potential in thermal power plants" (Electric power research institute Milan Vidmar, July 2007);
- "Land use, changes in land use and forestry – selection and preparation of methodologies and calculation of O_2 pollution sinks in Slovenia" (Forestry institute of Slovenia, September 2007);
- "Operationalization of CDM activities and analysis of potential in the Republic of Macedonia" (Institute for energy, October 2007);
- "Energy-climate package and HSE" (Institute for energy, September 2008);

- “CO_2 capture and storage potential of Unit 6 of Šoštanj Thermal Power Plant” (Electric power research institute Milan Vidmar, May 2010);
- “Capture Ready – carbon capture potential in coal-fired plants in connection with project solutions on Unit 6 ŠTPP” (Elek consulting, May 2011).

In the context of the consortium project ZETePO, two terms of reference have been prepared so far, while the third one will be finished in September 2011:
- “Implementation of ETS and CCS legislation into the Slovenian legal system” (Electric power research institute Milan Vidmar, February 2011);
- “Development of CO_2 capture technologies” (Elek consulting, October 2010);
- “Options of geological CO_2 storage in Slovenia and abroad”, which will be finished and surrendered to the client in September 2011 (Geological institute of Slovenia, University of Ljubljana – Faculty of natural sciences and engineering, Department of geotechnology and mining, HGEM, Nafta-Geoterm Lendava, ERICo).

On average, Unit 6 will emit 2.65 million tons of CO_2 per year, which is ca. 106 million tons of CO_2 in its expected service life. Because Unit 6 will likely be retrofitted with CO_2 capture and storage equipment as soon as it becomes commercially available and economically viable, space must be set aside for:
- A CO_2 capture device
- Modifications on the flue gas flow due to additional pressure losses
- Additional flue gas ducts between the FGD and the capture device
- Greater requirements for flue gas fans
- Modification and adjustment of the gas turbine
- Supplying the capture with a reagent and required energy
- Handling and storing waste material

Spatial requirements and layout of the CO_2 storage equipment:

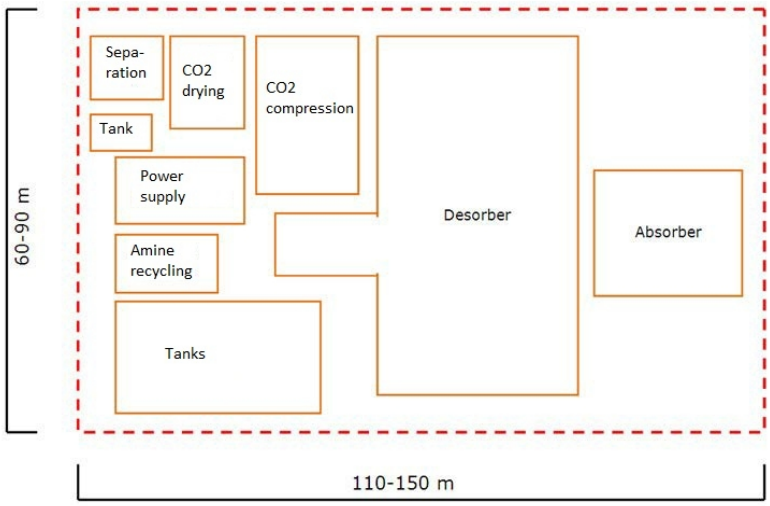


Image 4.8: Spatial requirements for CO_2 storage

Since there are two possible locations for subsequent retrofitting with CO_2 storage and compression equipment, this document defines them as reserved locations for potential subsequent retrofitting with CO_2 capture devices.

Image 4.9: Possible locations for retrofitting with CO_2 capture devices

4.6. MOVEMENT OF THE PEAK/BASE ELECTRICITY PRICES RATIO

The movement of the "peak" (8:00 to 20:00 Monday to Friday) and "base" (0:00 to 24:00 Monday to Sunday) price ratio depends on marginal costs of production during peak and base hours. Because the production capacities are busier during peak hours, production capacities with higher marginal costs are engaged to a greater extent, making the marginal price during these hours much higher than in off-peak hours. The images below show the movement of peak and base energy prices from 2005 on.

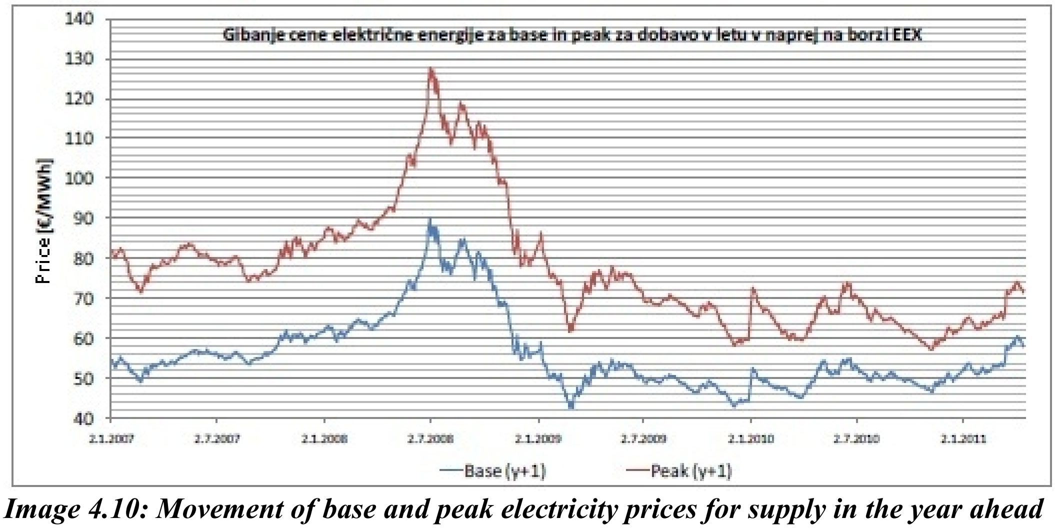


Image 4.10: Movement of base and peak electricity prices for supply in the year ahead

Besides the movement of peak and base energy prices, it is important to observe the relationship between both products. Image 4.11 below shows the movement of the ratio from 2005 on. Since 2009, we have been witnessing a decline of this ratio, which is a consequence of decreased electricity consumption due to a standstill in industrial production on the one hand, and on the other hand, because we are witnessing an increase in the volume of electricity produced from renewable sources, primarily the production of electricity in solar power plants which operate only within peak hours.

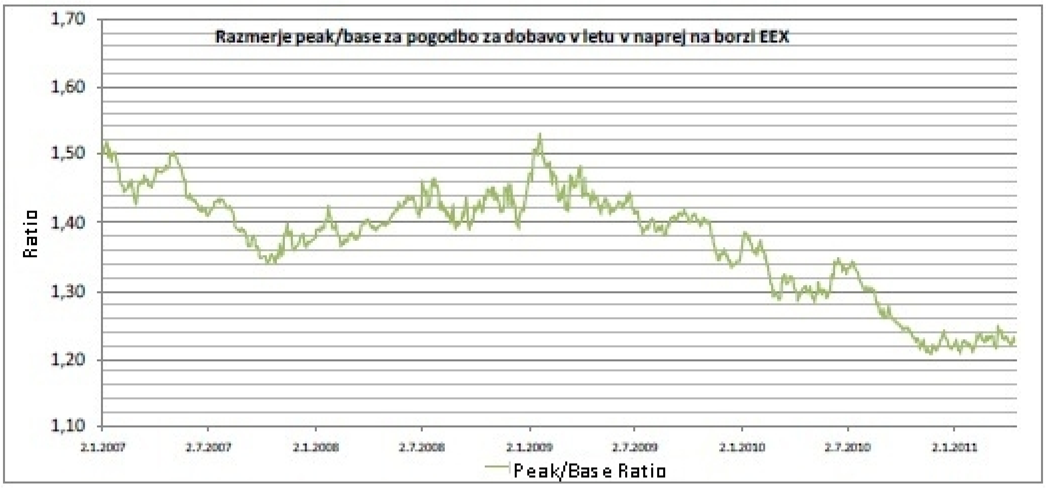


Image 4.11: Peak/base ratio for contracts for supply in the year ahead

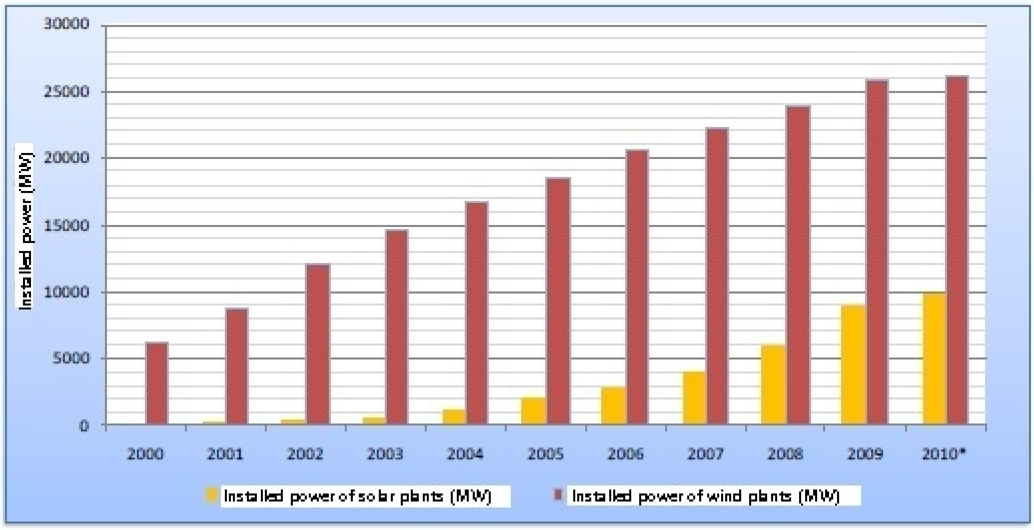


Image 4.12: Installed power of wind and solar power plants in Germany (Source: Point Carbon and BMU)

4.7. MOVEMENT OF COAL PRICES

Image 4.13: Movement of long-term CIF ARA coal supply contract prices in the year ahead with prices of forward supply of coal for 2012 – 2014

The diagram above shows the movement of prices of long-term coal supply contracts for the year ahead in Northern European ports, but it is important to add the this price includes the price of transporting the coal to the power plants. It is evident from the diagram above that the price of coal, similarly to other primary energy sources, reached its peak (5.5 €/GJ) in the summer of 2008, and then dropped to the value from 2006 in the following months. China's and India's demand for coal has the strongest influence on the formation of coal prices in the world markets, as they use as much as around 60 % of the annual consumption of coal, while the consumption of EU countries amounts to around 15 % of world consumption. The economies of China and India have survived the global economic crisis almost without a scratch and their demand for coal is still growing. Prices in the world market are shaped accordingly and they have been growing more or less constantly since early 2009. The reason for the slightly faster increase since autumn 2010 can partially be attributed to a disturbance on the supply end of the coal market, as two of the world's largest coal producers, Australia and Indonesia, were affected by floods and strong monsoon rains, which impacted the decrease of the production of coal. A very cold winter in Europe and consequential greater demand for coal was also an influencing factor in the increase of the price of coal. Another reason for the increased demand for coal is the recent accident in the Fukushima nuclear power plant. This has increased the demand for coal from Japan as well as from some other countries that are questioning the safety of nuclear plants. Here we can single out the European Union with Germany, where the opposition to nuclear power is the greatest. The possible premature shutdown of some European nuclear facilities would mean that the countries would have to replace the lost electricity production not only with the planned increase of generating electricity from renewable sources, but also with increased consumption of fossil fuels (especially gas and coal), which could additionally increase the demand for fossil fuels. With the current high prices of coal in the world market and relatively low prices of shipping, US coal producers are already inclined to export coal to Europe.

The further development of coal prices will greatly depend on the development of the prices of other energy sources, especially oil, because in the long run, the energy sources can be substituted with one another.

4.8. SITUATION AFTER THE ACCIDENT IN THE FUKUSHIMA NUCLEAR POWER PLANT

After the accident at the Fukushima nuclear power plant, confidence in the European nuclear production facilities was undermined. The most radical response to the accident took place in Germany, where seven power plants were shut down for three months for preventive inspections.

Shut down power plants in Germany	Power (MW)	Owner
Biblis A	1167	RWE
GKN-I Neckar	785	EnBW
KKI-1 Isar	878	EON
KKP-1 Philippsburg	890	EnBW
KKU Unterweser	1345	EON
KKB Brunsbüttel	771	VF, EON
KKK Krummel	1260	VF, EON
TOTAL	7096	

Image 4.14: German nuclear power plants that have been shut down as a precaution

Due to the shutdowns of nuclear power plants and increasingly relentless predictions that all German nuclear power plants will be shut down early, the price of electricity began to increase strongly on the daily as well as the long-term contract market.

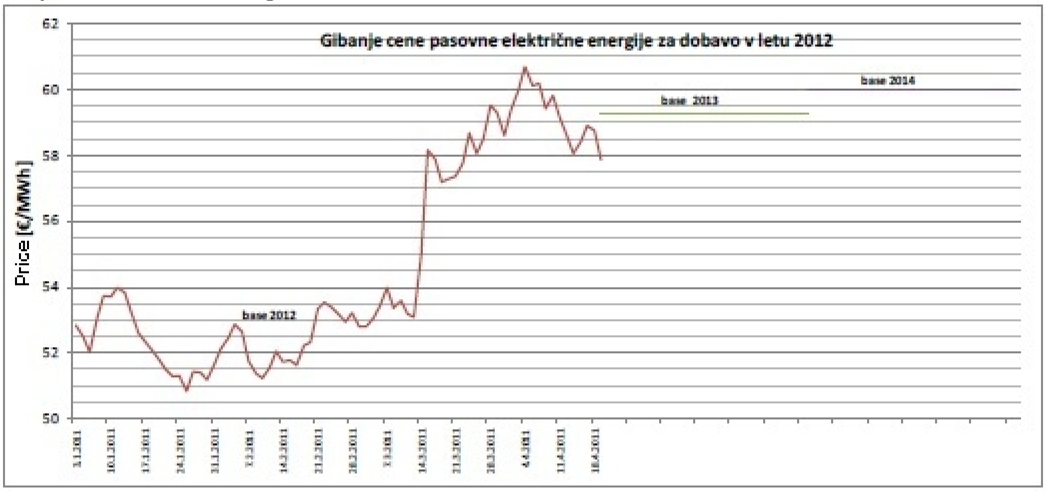


Image 4.15: Movement of base electricity prices for supply in 2012 and current prices of futures contracts for base-load electricity supply in 2013 and 2014 (Source:EEX)

Further price movements on the wholesale market of Continental Europe will depend on the decision of the German government on the fate of their nuclear facilities, developments on the global energy product market and the development of the CO_2 emissions allowance market.
Three scenarios of electricity price movements are possible:
1. Germany and other EU states decide to radically limit production in nuclear power plants, prices of energy products continue to grow sharply, and the European Commission decides to decrease CO_2 emissions by 30 %. In this case, the price of electricity will quickly rise to the record high from the beginning of 2008.
2. Germany will decide to gradually abandon nuclear options, production losses from nuclear power plants will gradually be replaced with coal and gas power plants and renewable power sources. The prices of energy sources will remain high, and there will not be any changes to the emission trading policies. In the event of this scenario, we expect a moderate increase of electricity prices in the years ahead.
3. The public opinion will once again become in favour of nuclear power plants and a new nuclear renaissance will take place. Renewable energy sources will be funded substantially, the CO_2 emissions trading scheme will be abolished. Based on more efficient use of electricity, consumption will not grow, which will be reflected in a greater surplus of production capacities. Based on the fact that the supply will greatly exceed the demand, the price of electricity will fall.

We estimate that scenario No 2 is the most likely one, meaning that the prices of electricity will increase in the years ahead.

4.9. PROJECTED SALES PRICES OF ELECTRICITY AND EMISSION CREDITS DURING THE SERVICE LIFE OF UNIT 6

Predicting the sales price of electricity and the price of emission credits for a period of 40 years is demanding, if not impossible. The current state on the market, short-term predictions, recent trends and long-term development assessments for ensuring sustainable development of the economic space and of society as a whole definitely need to be taken into account. Our country is increasingly becoming part of a wider economic space, and electricity production and marketing is becoming a normal economic activity. State measures in promoting production from renewable resources and efficient energy consumption will undoubtedly cause an increase of electricity consumption at the expense of other forms of energy or energy sources. This will add to the increase of electricity prices. The uncertainty of predicting prices can also be observed in Section 4.8, which shows the energy sector's rapid response in case of unforeseen events.

Based on market analyses and movements, AIP 3 and AIP 3 financial models from the end of 2009 take 71.5 € per MW into account as the possible achievable average sales price of electricity, including the price of emission credits at 20 € per ton of CO_2. The predicted sales price is expressed for production in the predicted base/peak ratio of sales from Unit 6.

Due to the reservations described above, AIP 4 uses electricity price and CO_2 emissions credits price scenarios predicted in the NEP draft to calculate the effects of the investment. The NEP draft has been under discussion for over a month and neither the professional nor the lay public have had any remarks so far on the electricity and emission credits price projections. The projected prices were calculated by a well-known institution (Jožef Štefan Institute) based on models, and if anything, it can be said that this institution certainly has no material or moral interest to manipulate the price projections in accordance with the wishes of individuals or interest groups. Because the NEP draft only predicts the prices of electricity and CO_2 emission credits until 2030, the same change as the average change in the entire period that the NEP draft predicts prices for was used for both items for the period 2030–2054. In addition to accounting for changes of both items predicted in the NEP draft, we have also increased the expenses of all items that ŠTPP will have during the project (coal costs, labour costs, additive costs etc.) by appropriate indices.

Several alternative scenarios in respect of input data for calculating the investment economics were possible when the programme was being prepared, and all options had positive as well as negative characteristics. Based on comparisons of different scenarios, we therefore decided that it would be best to use the price scenarios from the NEP draft.

Using the mentioned starting points, the discussion on the correctness of the prices in the calculation of economic viability of the Unit 6 investment can be avoided as much as possible. Table 4.10 below provides the sales prices of electricity generated from coal and prices of emission credits as listed in the NEP draft until 2030 and as they have been calculated until 2054 and taken into account when assessing the economic viability of the investment.

Image 4.16 shows the ratio between the price of electricity and the price of emission credits until 2054, as well as the projected correlation between the prices of these two categories.

5. ANALYSIS OF POSSIBLE TECHNOLOGIES

5.1. TECHNOLOGICAL OPTIONS

According to the available energy source, which is lignite from the Velenje Coal Mine, the following options for electricity generation using coal are put forward that are currently available on the world market and are more or less commercially successful. Technologies that are still fully in the development stage or in the pilot stage, are not covered.

Coal technologies can be roughly divided into:
• PCC - pulverised coal combustion
• FBC - fluidised bed combustion
• IGCC - Integrated Gasification Combined Cycle

Chapters 5.1.1 – 5.1.3 present the upper technologies briefly.

5.2 SELECTED OPTION

The following assumptions were taken into account when reviewing the available coal technologies and selecting the optimal variant:

- Required net power output of the plant – min 500 MW
- Plant efficiency
- Availability and prevalence on the market
- Price of the plant
- Possibility of further development

The comparison of basic parameters of existing technologies, based on the year 2005, when the technology analysis was prepared, can be observed in the following table:

Best available technology (BAT)	Power range (MWe)	Basic efficiency (%)	Availability	Investment expenses in 2005 ($/kW)
Pulverized black coal combustion with supercritical fresh steam parameters (PCC with USC)	300 – 1000	46	Highest	~1000
Circulating fluidised bed combustion (CFBC)	50 – 300	40	High	1000 – 1100
Pressurised fluidised bed combustion (PFBC)	<400	42	Medium	1300 – 1900
Integrated gasification combined cycle (IGCC)	<350	45	Medium	1500 – 2000

Source: Decon Study for the European Parliament; Implementing Clean Coal Technologies – Need of Sustained Power Plant Equipment Supply for Secure Energy Supply

By setting the required net power output of the plant at a minimum of 500 MW, the investor ŠTPP had already determined the technology for the replacement Unit 6 in 2005.

Considering all of the above, the fluidised bed combustion technologies and coal gasification were not identified as suitable due to the fact that such large units were not on the market yet or were still in a stage of development and as such inadequate for implementation in ŠTPP. Both technologies are also uncompetitive with pulverized combustion technology in terms of efficiency. Even though gasification is approaching pulverized combustion, a problem of reference applications in practice arises (most of the thermal power plants with coal gasification technology are in one way or another still in the demonstration stage), which makes this technology immature for commercial use. The fact that the specific costs of building the other two technologies are higher (circulating combustion) or significantly higher (gasification) also speaks in favour of pulverized coal combustion technology. In terms of prevalence or use on the market, the share of pulverized coal technology is 90 %, which was an additional argument in favour of this technology.

In view of all these facts and the actual state of the technology and prevalence or use in practice, selecting a PCC boiler for the future Unit 6 was, according to the assessment of the investor ŠTPP, the only reasonable choice considering the latest achievements of technology in this field.

6. TECHNICAL AND TECHNOLOGICAL ANALYSIS

Demand for economically and environmentally more rational production of electricity in TEŠ lead to urgent need for replacing existing units with a new block.

In the preliminary works phase (the findings are listed in chapter 5), ŠTPP considered the latest coal-fired energy production technologies, which are appropriate for use in the new Unit 6. Pulverized coal combustion (PCC) technology with supercritical steam parameters (275 bar, 600/610 °C) with the so-called BoA (Betriebsoptimierte Anlagen) technology and 600 MW power on the generator terminals with a power plant operational regime was selected as the most suitable technology.

A 120 MW_{th} thermal station for remote heating of the Šaleška valley is planned in the context of Unit 6, with an average annual calorific power of 50 MW_{th}. At this power, the electric power of the unit decreases to ca. 13 MW with the same boiler load, but the fuel efficiency increases to more than 45.5 %.

The new structure will be located west of the existing structures, on a plateau which will become available after the removal of cooling towers for Units 1, 2 and 3 and a part of the administration building. It will be built on an E–W axis, with the engine room next to Unit 1 and the bunker, boiler room, electrostatic precipitator and the desulphurisation device in the West, facing Šoštanj. The cooling tower is south of the Unit, built into a hill.

Coal from the nearby Premogovnik Velenje mine will be used as fuel. It will be transported into the boiler bunkers on reconstructed existing conveyors of Unit 4 and on newly built ones to Unit 6.

The cooling water will be provided by an extension of the existing inflow facility on the river Paka and new decarbonisation will be installed. The existing chemical water treatment will provide the demineralized water.

The products of combustion and desulphurisation (ash, gypsum and slag) will be marketed to the construction industry, and the surplus will be processed into a stabilizer for mine subsidence control. TEŠ successfully markets the waste products already now. Demand for ash, gypsum and slag is higher than the available supplies. Already today TEŠ receives 1 million EU of income from this activity and this is why it is estimated that marketing waste products will be successful also in the future.

Unit 6 will operate without waste water discharge. This will be achieved by recirculating and purifying the industrial water and reusing it. Only the cooling tower bilge, which will fully meet the environmental protection conditions for discharge into the watercourse, will be discharged into the river Paka. The solid waste from the waste water treatment will be handled by an authorised client – a concessionaire.

The unit will meet all environmental protection conditions in accordance with EU regulations. Due to the limits of noise impact, the equipment will be set up in closed structures with adequate protection for noise dampening.

At the unit, there is a planned place for setting up device for capture of CO2 (CCS ready), if the regulations in future will demand it and storing CO2 will be commercially available.

Basic Unit Information:

Power (Generator)	MW	600
Own consumption	MW	54.5
Threshold power	MW	545.5
Spec. consumption	kJ/kWh	8,451
Fresh steam	kg/s	420.7
	bar/°C	275/600
Resuperheated steam	bar/°C	56/610
Feedwater temperature	°C	290
Condensation pressure	mbar	42
Flue gas temperature upon exit from the boiler	°C	145
Operating power range	%	42–100
Load change	MW/min	12
Fuel: Premogovnik Velenje mine lignite		
Mass flow	t/h	440.3
Net calorific value	kJ/kg	10,470
Ash	%	16.7
Moisture	%	37.5
Sulphur	%	1.41
Emissions		
SO_X	mg/nm^3	< 100
NO_X	mg/nm^3	< 150
CO	mg/nm^3	< 250
Dust	mg/nm^3	< 20
CO_2 (100 % power)	t/h	473.8
Noise	dB(A)	< 48 on threshold

Boiler	Benson, tower design	
Turbine	Triple, with single resuperheat	
No. of regenerative heaters	9+1	
Remote heating	Installed	120 MW
	Average wintertime	80 MW
	Average summertime	30 MW
Generator	Water/hydrogen cooled	727 MVA
Transformer unit	21/410 kV	710 MVA
Feed pumps	3 x 50 %, electric motor drive	
Firing	PCC, tangential, NO_X optimized burners	
Ignition firing	Fuel oil	
Coal mills – fan mills	8 x N250 (1x backup)	

Flue gas cleaning	scrubber
Flue gas outlet	Non-heated into cooling tower
Cooling system	Natural draft cooling tower
Cooling water preparation	Decarbonisation, lamellar reactor
Product processing	Processing into a stabilizer for mine subsidence control Sale of gypsum and ash (up to 50 %)

6.1 BOILER PLANT

6.1.1. BASIC TECHNOLOGICAL DATA

Boiler Type
Coal-fired forced-flow "once-through" boiler with supercritical fresh steam parameters and single steam resuperheating.

Execution
Tower boiler with single draft heating surfaces, with a square cross-section furnace and a hanging design.

Regulation method
Modified sliding pressure with a 42 to 100 % load.

Firing
Tangential firing: presumably with 8 coal dust burners on two plains. The firing and the combustion air intake will be designed for maximum combustion efficiency and effective prevention of the formation of harmful nitrogen oxide.

Pressure System
The boiler's pressure system includes a water heater, vaporizer, superheaters and reheaters. The basic parameters are:

Fresh steam flow	kg/s	420.7
Fresh steam pressure	bar	275
Fresh steam temperature	°C	600
Resuperheated steam pressure	bar	56
Resuperheated steam temperature	°C	610
Boiler feedwater temperature	°C	290

6.1.2 GENERAL DESCRIPTION

The entire pressure part of the selected tower design of the boiler is hanging on the load-bearing construction of the boiler. This design has several advantages compared to other boiler designs, for example:

- Smaller volume,
- Smaller floor plan,
- Smaller mass,
- Possibility of higher load gradients.

The furnace will have a square cross-section, allowing for an optimal choice of the number and power of burners and their layout, in order to produce combustion and heat transfer that are as uniform as possible. Three fuel feed pumps run by electric motors through hydrodynamic clutches, which enable revolutions regulation, will supply the boiler.

Domestic lignite from the Premogovnik Velenje coal mine is the planned fuel.

For units with boiler plants such as this one, regulation with sliding pressure or modified sliding pressure, where the fresh steam pressure changes with the load, has proven to be the most suitable.

6.1.3 PRESSURE SYSTEM

The pressure system consists of the:
- water heater,
- wall mounted evaporator,
- water separator,
- steam superheater,
- steam resuperheater,
- connecting pipelines and steam cooling system,
- boiler fitting,
- initiation system.

The high steam parameters require the use of adequate materials, primarily austenitic and martenisitic steel, which has been developed and tested for these purposes in recent years.

6.1.4 FIRING

Coal bunkers, feeders
Eight concrete coal bunkers, installed in the bunker building between the engine room and the boiler room, are planned for the supply of coal. Eight feeders are planned for the capture of coal – they will be designed as pressure transporters with electric motor drive with frequency regulators. Due to spatial restrictions, four of the feeders are bipartite.

Mills
Eight fan mills are planned for the purpose of coal milling, and they will be placed on height ±0 with direct coal mixture injection into the boiler. Coal with net calorific value of 9,200 kJ/kg and 40 % moisture will be taken into account when designing the mills. The required capacity of the mills will be 72 t/h. At full strength, it will be possible to supply the boiler with seven mills. This way there is always at least one backup mill, allowing for adequate continuous maintenance. The mills will be powered by electric motor drive and a hydraulic clutch.

Hot flue gas from the furnace and recirculated cold flue gas will be used for drying the coal and cooling the mills. The flue gas will be captured from the flue gas channels behind the draft fans and supplied into the primary combustion air conduit through special channels with the help of two ventilators.

Burners
Coal combustion will be handled by eight burners in a tangential layout in two plains on the rim. Every mill will supply its burner in a vertical direction. The burners will use substoichiometric combustion and a supplementary supply of combustion air in the top part of the furnace. Light fuel oil is planned for ignition firing. The ignition firing capacity will be 25 % of the pulverized coal firing. Existing equipment of ŠTPP will be used for storage and supply.

6.1.5 EXHAUST AND COMBUSTION AIR SYSTEM

The combustion air supply system will be designed in two tracks. The combustion air will be supplied by two axial flow fans, which will capture the air either outside or from under the boiler room's ceiling, a process which will be regulated by suitable hatches.

The fans will be installed on height ±0 and fitted with a system to monitor the position of the rotor blades, in order to regulate the air quantity.

Before entering the boiler, the air in two regenerative air heaters will be heated by hot flue gas. At least 85 % of the air entering the boiler must be supplied in a controlled fashion through the air heater. From there, two channels will supply the air into a circular channel and from there it will travel, as primary air, into return ducts to the mills, as secondary air to the burners, and as upper air directly into the furnace above the burners (Ausbrandluft). Only hot air will be router to the incinerator grate.

Two steam air heaters will be set up in the fresh air line before the regenerative heaters with the purpose of heating air in the wintertime.

Two axial flow fans will be in charge of flue gas evacuation. They will be installed behind the electrostatic precipitators, in a separate building, which will serve as protection against noise.

The ventilators will be fitted with a flue gas quantity regulation system and a system for changing the position of the rotor blades. Two recirculation fans for cooled flue gas are planned for regulating the temperature in the mill's sorter. They will return the cooled flue gas into the primary combustion air duct.

In the event of a system malfunction or a desire for economic operation, the shut-off valve system in the channels will enable the unit's operation with only one air–flue gas line within the range of 42 to 60 % of full power.

6.1.6 INTERNAL SLAG DRAINAGE

A two-part incinerator grate with a hydraulic drive will be installed under the boiler funnel to reduce losses due to unburned coal.

A wet slag remover, designed as a chain transporter with scrapers will be placed under the incineration grate. Mechanically purified crude water will be used to cool the slag falling from the grate. The contaminated water will be drained into the waste water treatment plant.

6.2 TURBO GENERATOR WITH AUXILIARY SYSTEMS

6.2.1 TURBINE

The turbine will be axial, extraction and condensing, with single steam resuperheating. It is part of a series of newer turbines with separate high pressure (HP), medium pressure (MP) and two low pressure (LP) cowlings. It will be placed on height ± 15 m, on a special base – a turbine table supported by springs and separate from the rest of the building's construction.

The turbine shaft will be mounted on radial plain shaft bearings between cowlings and on both ends, except between the HP and MP section, which will have a radial axial bearing required to endure axial load as well.

High-pressure part of the turbine
The input parameters for fresh steam are 600 °C and 275 bar. The turbine housing consists of inner and outer housing, separated into two parts – lower and upper – with a longitudinal joint. The longitudinal joint also separates the inner housing. The two halves are joined together with special doublers. This shape allows for lower masses and shorter startup times.

Medium-pressure part of the turbine
Resuperheated steam with a temperature of 610 °C and 56 bar of pressure enters into the medium-pressure part of the turbine. This part has a twin design (the steam flow splits in two upon entering) in double cowling, which consists of an inner and outer housing. The housings are two-part, separated into an upper and a lower part with a longitudinal joint.

Low-pressure part of the turbine
The steam in the LP turbine expands to 42 mbar(abs) of pressure in the capacitor. To ensure appropriate output cross-section, two LP parts of the turbine will be built. The low-pressure part is also a so-called twin, with the two-wing turbine encased in double cowling, composed of inner and an outer double housing, separated into an upper and a lower part with a longitudinal joint.

6.2.2 GENERATOR

The generator will be a three-phase, two-pole turbo generator with a cylindrical rotor, connected to the turbine only via the clutch. It will be hydrogen-cooled, the hydrogen being cooled with cooling water from the main cooling system. The stator will be cooled directly with water. A detailed description of the generator can be found in chapter 5.11.2.

6.2.3 TURBINE AUXILIARY SYSTEMS

6.2.3.1 Regulation and protection

The protective system protects the turbo generator against events which could cause damage or even breakage. It includes measurements of vibration control, bearings temperature, housing and shaft elongation, and other measurements. The protective measurement system is based on a 2 out of 3 principle. The turbine regulation has a built-in electro-hydraulic regulator, which is in charge of reliable and smooth turbine operation within the entire load range.

Quick-action and regulation valve
Two quick-action and regulation valves before the HP and two before the MP part of the turbine suffice for the selected regulation system with modified sliding pressure. The valves are combined so that a single housing combines a regulation valve and a quick-action valve with separate hydraulic servo motor drives. The quick-action valves close with a spring, shutting off the supply of steam into the turbine as soon as the hydraulic fluid pressure drops.

Low pressure circulation system
The steam that the turbine is unable to take in is discharged into the capacitor through the LP circulation system. The system's capacity is sized to 2x35 % of steam quantity. Steam surplus usually occurs during startup, failure and rapid stops. The opening and closing of the LP circulation system is steered by the unit control system (DCS).

High pressure circulation system
If need be, the high pressure reducing station reduces and cools fresh steam and ensures the cooling of the steam resuperheaters at startups and rapid stops of the turbine. It is sized to 110 % of steam quantity, which is why the steam pipelines from resuperheating are the only ones equipped with relief

valves. The system is located on the connecting steam pipelines between the fresh steam pipeline and the pipeline for the cool section of resuperheating.

6.2.3.2 Auxiliary Systems

The lubricating oil system supplies the turbine and generator bearings with lubricating oil and drives the rotor rotating device. The main 1x100 % oil pump, propelled though the main turbine shaft, and two auxiliary 2x100 % oil pumps with electric motor drives supply the lubricating oil to bearings. An emergency 1x40 % direct current lubrication pump is also planned. Two 2x100 % HP geared lubrication pumps with electric engine drives will be installed to start the rotor at shutdown and startup. The pumps will be powered via cables, which will be, for safety purposes, laid in a variety of routes.

The oil will be cleaned with duplicate filters, so cleaning will also be possible during operation, and cooled with two 2x100 % capacity oil/water coolers. A bypass of oil past the cooler will regulate the oil temperature.

The hydraulic oil system supplies the hydraulic control systems and hydraulic drives with hydraulic liquid. A common hydraulic oil system with two electric motor driven pumps (2x100 %), a common reservoir and a dual filter are planned.

Due to fire safety, the oil stations will be located in a special area on height ±9 m and the oil ducts will be placed into special pipes within the turbine base, and the oil ducts on the turbo generator will be equipped with a fire extinguishing system.

6.3 CAPACITOR SYSTEM

A bipartite tubular condenser with a hotwell underneath is planned. The outer layer and side chambers are manufactured as a welded steel sheet construction, while the tube bundles and front tubular plates are made of stainless steel.

The capacitor will be equipped with a device for continuous mechanic cleaning of capacitor pipes. Two water ring vacuum pumps will maintain the vacuum in the capacitor and eliminate inert gases from the capacitor.

Two main capacitor pumps (2x100) are planned. Normally only one pump will be operating, while the other one will be a backup and will come on in case of failure of the primary pump and in case the condensate level in the hotwell rises.

The high-pressure boiler requires high quality water to operate, so the water will be purified in a condensate purification system during startup and operation of the unit. The system will be sized to the capacity of 3x50 % of the total condensate quantity (1x backup for regeneration). It will consist of three identical lines, with the individual lines composed of a mechanical and a mixed ion filter.

Circulation through the device will be ensured by two pumps (1 backup) with a capacity of 100 % of the total condensate quantity. The condensate from the hotwell will be pumped through the filters and then the purified condensate will be pumped to the main condensate pump, which pumps the condensate through low-pressure heaters into the supply tank.

6.4 REGENERATIVE HEATERS, SUPPLY TANK AND FEED PUMPS

Five low-pressure (LP) heaters, which will heat the condensate with the off-take steam from the MP and LP part of the turbine before it enters the supply tank, are planned for heating the condensate. The heaters will be designed as tubular heat exchangers welded out of U-tubes, in which the main condensate will flow. Heaters A1 and A2 will be set up as a double heater and built into the upper part of the capacitor.

Regenerative feedwater heating will be conducted in four stages: in HP heaters A7, A8, A9 and steam cooler A7a. The heating steam will be collected from off-takes on the HP and MP parts of the turbine and from the cool resuperheating duct. The heaters are designed with U-tubes and water chambers in the lower part.

The 400 m^3 volume of the supply tank will ensure uninterrupted supply to the boiler in all operating modes, as well as its safe shutdown. In the normal mode, the temperature and pressure in the tank will be maintained by the steam from the off-take on the MP part of the turbine.

Construction of a horizontal deaerator, placed directly above the supply tank, is planned as a means of degassing.
Three sets of feed pumps with 3x50 % capacity will also be built in. Every set consists of a:
- Roughing pump,
- Main pump,
- Hydraulic bearing,
- Electrical motor.

6.5 THERMAL STATION

Within the Unit 6 project, the construction of a replacement thermal station (TS3) is planned to replace TS1, which will be permanently shut down with the shutdown of Units 1 – 4. The purpose of the thermal station is remote heating of the Šaleška valley.

The rated thermal capacity of the TS will be 120 MW, with the average thermal output of 80 MW in wintertime and 30 MW in summertime. The TS will be designed with two steam–water heat exchangers on the HP and two on the LP level of the steam side, and with two peak heat exchangers. The steam for the heat exchangers will be collected from off-takes A4, A5 and A8 on the turbine. The thermal station will be connected to the existing main hot water pipeline towards Velenje and Šoštanj.

6.6 COOLING SYSTEM

Thermal dissipation, which happens in the cyclical process or as a consequence of the operation of various machines and devices, will be resolved with the cooling system of the new Unit. The system roughly consists of:
- The main cooling system and
- The plant cooling water system.

The main cooling system will be a closed-type system with circulation cooling and decarbonised water as a cooling agent. It will consist of:
- A cooling tower,
- Pipelines,
- Two circulation pumps,
- Fittings and
- Heat exchangers.

The natural draft cooling tower is positioned into the hill south of the Unit. A suitable supply of cooling air will be achieved with adequate excavation of the slope. The tower's main dimensions are:
- Diameter at the upper edge of the foundation 103.00 m
- Diameter at the narrowest part of the outer layer56.00 m

- Outer layer height 157.00 m
- Air inlet height 8.20 m

Basic cooling system data:

- Cooling water flow 61,000 m^3/s
- Water heating 9.0 °C
- Cooled water temperature 17.7 °C, with 10.6 °C outside temperature and 75 % moisture

The cooling water takes on the capacitor heat as well as the heat from two plant cooling water exchangers. The heated water from the main cooling system will be cooled in a standard natural draft cooling tower with a single spray zone and a collection basin.

With the plant cooling water system the users of Unit 6 are cooled with conditioned demineralised water in a closed circuit. This water is then cooled with water from the main cooling system in the plant cooling water system's two coolers.

6.7 FLUE GAS CLEANING

The requirements for flue gas cleaning are based on the Environmental permi for Unit 6 (received on 16 February 2011), which defines the following values (in dry flue gas at 6 % O_2):

- SO_2 < 100
- NO_X < 150
- dust < 20

The first stage of the cleaning is done in the boiler, where slag and coarse ash are extracted from the flue gas. By using modern burners with gradient air control one can achieve combustion with low O_2 values, ensuring low NO_X values upon exit from the boiler (under 400 mg/nm^3, in dry flue gas at 6 % O_2).

A NO_X selective catalytic reduction device is installed in the smoke duct between the boiler and the air heater. By dosing aqueous solution of ammonia (NH_4OH), NO_X is broken down into N_2 and H_2O in the catalysts. The NO_X emissions will be lower than 150 mg/nm^3 (shown as NO_2 in dry flue gas at 6 % O_2), while the concentration of the leftover ammonia will be under 3 ppm. Units 5 and 6 will have common ammonia water storage.

The flue gas cooled in the air heater is then channelled into the electrostatic precipitator, which extracts the dust particles. The precipitator is sized to reach a concentration below 20 mg/nm^3 of dust in flue gas (dry, 6 % O_2) or 30 mg/nm3 in the case of 60 % operation of one line.

A flue gas desulphurisation device is placed behind the electrostatic precipitator. It is sized for a 2,100,00 nm^3/h flue gas flow, which corresponds with the conditions in case of bad-quality coal from the Premogovnik Velenje coal mine, and an input SO_2 level of up to 8,200 mg/nm^3 (dry flue gas at 6 % O_2).

Limestone ($CaCO_3$) based wet scrubber technology was chosen as the most appropriate method of treating the flue gas, with gypsum as a by-product. The treated flue gas will not be reheated and will be channelled into the cooling tower. The device operates without waste water. A gypsum suspension, mixed with ash into a stabilizer, is sufficient for providing the necessary fluid discharge for maintaining the permitted concentration of chlorides and fluorides.

A vacuum belt filter (2x100 %) will be installed directly above the gypsum silo. Part of the gypsum will be passed to interested clients for further processing, while a part will be mixed with ash and slag and processed into a stabilizer in accordance with the Slovenian technical approval (STA) and used for mine subsidence control.

The active part of the scrubber will be lined with stainless steel, while the suspension vessel is rubberised. The entire treatment plant equipment is in a closed building to protect against noise emissions and low temperatures.

The draft fan will be installed between the electrostatic precipitator and the flue gas desulphurisation device, so the device will operate under overpressure conditions. The speed of the flue gas in the scrubber is 4 m/s and double action spray nozzles are used.

Additionally, the scrubber will also separate part of the ash and chlorine and fluorine compounds. The following emission figures will be achieved upon exit from the device:

- SO_2 < 70
- SO_3 < 30
- HCl < 100
- HF < 15
- dust < 20

As for the elimination of CO_2 from flue gases, the device is suited for upgrading with a treatment plant, if future regulations require it. A place is allotted beside the device for the construction of CO_2 elimination equipment – on the location of the existing cooling tower of Unit 4, which will become non-operational once Unit 4 is shut down.

6.8 COAL SUPPLY

The new unit will be designed for the exclusive use of domestic coal from the Premogovnik Velenje coal mine. The existing transport system of Units 1 – 4, which will have to be partially rebuilt, upgraded to a capacity of 800 t/h, and supplemented with some auxiliary equipment, will be used for supplying the unit with coal. The coal depot, coal abstraction and transport to interim bunkers PE-24 will stay as is, only the PE-05 sifting station will be supplemented with a transport connection to supply the new Unit, namely two transporter belts with 2x800 t/h capacity (2x100 % with lowest quality coal with 9.4 MJ/kg calorific value) that will run to the sifting station beside the new Unit. There the transport direction will make a 90° turn and continue on with two transporters of the same capacity, which will run to two reversible transporters above the bunkers, with which the coal will be distributed to eight bunkers. All transporters will be closed bin transporters with a walking platform beside or between them.

6.9 PRODUCT PROCESSING

This chapter describes the processing of solid coal combustion products and flue gas desulphurization. The first group includes slag from under the boiler, crude ash from in front of the air heater, and fly ash, while gypsum is the product of desulphurisation.

It is foreseen that the slag, crude ash and gypsum will be processed, in accordance with the Slovenian technical approval (STA), into a stabilizer which will be used for mine subsidence control like the stabilizer from existing Units 4 and 5. The slag is transported from the slag remover into the sieve-crushing plant and, after adding moistened crude ash, into a 300 m^3 silo. From the silo, it is added onto a transporter belt with a chain feeder (2x100 %) and mixed into the stabilizer. The fly ash will be transported from the electrostatic precipitator funnels into a 2500 m^3 silo through a system of pressure vessels. It will be used for reinforcing walls and filling holes in the Premogovnik Velenje coal mine, for the construction industry, and the rest will be mixed into a stabilizer together with the gypsum suspension.

Gypsum dried on the vacuum belt filter will be stored in a transitional silo of 3000 m3 size and used for construction, while the rest will be mixed into the stabilizer.

The products in the form of a stabilizer will be transported with the transporter belt to an existing interim depot, and from there with construction machinery to the mine subsidence.

6.10 WATER SUPPLY

6.10.1 TECHNOLOGICAL WATER SUPPLY

The new unit needs the following waters to operate:
- Demineralized water for filling and covering the losses of the boiler, plant cooling water system and thermal station;
- Decarbonised water for filling and covering the losses of the main cooling system and partially the flue gas desulphurisation device;
- Mechanically treated technological water for the slag remover and other auxiliary systems;
- Crude water in drinking water quality for auxiliary and other systems which require better quality water.

The existing equipment to prepare demineralized water has recently been modernized and has enough reserve capacities for the new unit, which will use up to 80 m^3/h of demineralized water on average.

The existing structure for the capture, gross and fine purification of water will be expanded for the purposes of the new Unit. The mechanically purified water will be pumped directly to the end-users from here. The direct use of mechanically purified water is estimated at around 50 m^3/h. Sand filters for filtering main cooling water will be placed in the main operating unit. They will have capacity of cleaning 1100 m3. Content of dispersed elements will be under 2 mg/l.

A new 1x100 % reactor with a capacity of 1,200 m^3/h will be built for decarbonisation. This decision is based on the fact that in case of failure, the reserve can be supplied by the existing decarbonisation equipment. The reactor will be a round blade reactor with a mixing vessel. Lime milk, iron chloride and flocculants will be supplied into the centre. It is expected that the level of dispersed substances in water behind the reactor will be so low (up to 5 g/l) that additional filtration of decarbonised water will not be necessary.

Decarbonised water will be collected in the decarbonised water reservoir for further use. In the same building, the facilities for storage and preparation of chemicals necessary for the decarbonisation will be located. Waste waters from the decarbonisation process will be collected in the mud water reservoir and pumped into the mud separation system. The mud will be separated in centrifuges and taken to a landfill. The separated water will return to the reactor.

The consumption of decarbonised water (at external temperature of 20 °C) has been estimated to:
- up to 745 m^3/h to cover evaporation losses in the cooling tower,
- up to 330 m^3/h for desludging the main cooling system,
- up to 135 m^3/h for the flue gas desulphurisation equipment,
- up to 15 m^3/h for washing the sand filters.

Considering minimum reserves, industrial water will be taken from the Paka river or the Družmirsko jezero lake in the average amount of 1,300 m^3/h.
Crude water of potable quality will be supplied from the existing system. Planned consumption will amount up to 20 m^3/h.

6.10.2 WASTE WATER TREATMENT

The waste water treatment system will remove suspended particles from water and return the purified water into the new decarbonisation reactor. The suspended particles will be eliminated roughly in the sedimentation tank, after that mud will be concentrated in centrifuge and the pressed cake will be taken over by an authorised waste collector – concessionaire. The following waste waters will be treated this way:

- water for washing the rotary sieves at the pumping station,
- mud water from the Unit 6 reactor,
- mud water from the Unit 4 and 5 reactors,
- water for washing the sand filters for cooling water purification,
- waste water from the slag remover.

To maintain the permissible level of suspended particles in cooling water, part of which is released into the watercourse as bilge, a cooling water purification plant is planned. It will be installed in the machine room and connected to the pipeline for desludging the cooling system. The water will be filtered through sand filters and returned into the cooling system. Waste water from washing the sand filters will be directed into the waste water sedimentation tank.

6.11 ELECTRICAL ENGINEERING

Šoštanj TPP is planning the construction of a new unit with rated operational power of 600 MW. The rated apparent power of the generator is 727 MVA, and the rated apparent power of the transformer block is 710 MVA. The unit will be connected to the electric power system of Slovenia through a 400 kV switchyard and a 400 kV overhead line. Overall own use of the unit will be powered by the 110 kV grid.

6.11.1 INTEGRATION INTO THE ELECTRIC POWER SYSTEM OF SLOVENIA

The new 600 MW Unit 6 will be connected to the 400 kV electric power system of Slovenia through a 400 kV switchyard and a 400 kV existing overhead line. The maximum threshold power of Unit 6 will be 545.5 MW.
Overall own use of Unit 6 will be powered from an existing 110 kV switchyard. Startup of the Unit will only be possible through the 400 kV network. A generator breaker will be used for this purpose.

6.11.2 TECHNICAL DESCRIPTION

GENERATOR

- Rated power: 727 MVA
- Rated operational power: 618 MVA
- Frequency: 50 Hz
- Rated cos(ϕ): 0,85
- Rated voltage: 21 kV
- Rated revolutions: 3000

The generator will be a three-phase, two-pole turbo generator with a cylindrical rotor. The insulation in the stator and rotor coils will be grade F, but the temperature at full load will not exceed grade B.

The generator rotor will lie on radial bearings, which will constantly be supplied with bearing lubrication and lifting oil. The generator cooling will be a combination of hydrogen cooling for the rotor and water cooling for the stator. The generator will also fulfil the reactive power requirement in the 400 kV grid with its cosϕ.

STATIC EXCITATION SYSTEM
The generator excitation system will enable a fast response in case of any disturbances in the electricity system, allow for stable operation, and ensure the necessary reactive power in the electricity system.

The generation excitation will be powered by a special exciting transformer. The generator excitation system will be equipped with a two-channel redundant voltage regulator and will assume the following functions:
- Adjustable voltage drop compensation due to reactive and operational power,
- Voltage limitation,
- Excitation current limitation,
- Stator current limitation,
- Voltage and cosφ regulation,
- Stabilisation of systemic fluctuations.

ELECTRICAL PROTECTION OF THE UNIT
Unit protection will include generator and transformer block protection. The block protection will be numeric with a built-in microprocessor and a modular design. All protective functions will be redundant.

When the generator protection will be operational, the generator will be separated from the network. This will happen in case of internal generator error and grounding, external failure on other elements of the electricity system or in case of abnormal operating conditions.

SYNCHRONIZER
A synchronisation device will synchronize the generator with the network. The generator synchronization will be performed by a circuit breaker in the 400 kV switchyard.

TRANSFORMER BLOCK
- Rated power: 710 MVA
- Transmission at standstill: 21/410 kV ± 8x1.25 %

The regulating transformer will have the option to regulate the transmission ratio on the primary side, and will be connected to shielded generator busbars on the secondary side. The primary side will be connected to the 400 kV switchyard with cables. The block transformer will stand on an external transformer plateau.

TRANSFORMER FOR THE UNIT'S OWN CONSUMPTION
Two identical triple-wound transformers with the following characteristic will be used for the Unit's own consumption:
- Rated power: 70/40/45 MVA
- Transmission at standstill: 21/10.5 kV ± 8x1.25 %

Since the transformer will be a regulating transformer, it will have the option to regulate the transmission ratio on the primary side even during operation. The transformer will also be equipped with all the protection necessary for safe operation. The transformer will be located on an external transformer plateau.

TRANSFORMER FOR GENERAL OWN CONSUMPTION
- Rated power: 40 MVA
- Transmission at standstill: 115/10.5 kV ± 8x1.25 %

The transformer will be connected to the 110 kV network of the existing GIS through field =E03. The transformer will be installed externally. Since the transformer will be a regulating transformer, it will have the option to regulate the transmission ratio on the primary side even during operation. The transformer will also be equipped with all the protection necessary for safe operation.

ENERGY JUNCTION

When planning the single-pole scheme, the need for suitable operating availability of the new Unit was taken into account. The voltage levels for own consumption will be:

- High-voltage 400 KV level for electric power transmission,
- High-voltage 100 KV level for startup and powering of general consumers,
- Medium-voltage 24 kV for the generator busbars level,
- Medium-voltage 10.5 kV level for engines, transformers 10.5/0.72 kV,
- Low-voltage 0.69 kV and 0.4 kV level for small consumers,
- Uninterruptible power system with 200VDC, 220VAC and 24VDC voltage for those technological consumers, who need a constant source of voltage due to technological demands, and for powering metering and regulating equipment.

<u>Medium voltage level 10.5 kV</u>
The medium voltage distribution will be composed of two distributors:

- The Unit's own consumption
- General own consumption

The Unit's own consumption is used for powering larger consumers which are needed for the Unit's normal operation, and is powered by the own consumption transformer. It is divided into two sections. Consumers are distributed over both sections so that the Unit is able to operate with reduced power despite the failure or malfunction of one section.

General own consumption is used for powering consumers of general significance that need to operate even in case of shutdown or failure of the Unit. General own consumption is powered from the general own consumption transformer and is also divided in two sections. In case of a malfunction of the Unit's own consumption transformer, operation of the Unit will be possible through general own consumption. Automatic switching will be in charge of switching between the various powering options at the 10 kV level.

The main medium voltage distributor will be placed under the bunker part of the Unit itself, while auxiliary distributors will be installed in auxiliary structures. The medium-voltage cells will be shielded and will have standard circuit breakers, protective and measuring devices.

<u>Low voltage level 0.69 kV and 0.4 kV</u>
Low voltage levels 0.69 kV and 0.4 kV will be used. The low voltage junction will also be divided into sections. Delivery to the sections will take place through transformers from several sources of the Unit's and general consumption. This will also ensure more reliable operation of the unit. In case one of the 10.5/0.72/0.4 kV transformers fails, the section powered by the malfunctioning transformer can be powered by another one.

Unit 6 will also have its own diesel aggregate within the general own consumption. The aggregate will turn on automatically with a specific time delay in case of power failure on the main 0.69 kV junction and unsuccessful automatic switching. The main low voltage distributor will be placed in the engine room of the Unit itself, while auxiliary distributors will be placed in auxiliary structures.

<u>Guaranteed voltage</u>
Vital consumers need guaranteed power supply even in case of total failure of 0.69 kV or 0.4 kV sources from the Unit's own consumption. This is why the technologically most important consumers will be connected to a special 0.69 kV or 0.4 kV own consumption section, which will be connected to

the general own consumption during normal operation. In case of power supply loss, the diesel aggregate must start.

<u>Uninterruptible power supply system</u>
The uninterruptible power supply system is used to power systems that are required to operate even in case of total voltage failure. In case of main source failure, the powering of direct current consumers is taken over by a battery until the diesel aggregate starts. The aggregate assumes the load of all consumers powered from the guaranteed voltage and from the uninterruptible power supply system.

<u>10.5/0.72 kV/0.4 kV transformer</u>
Transformers for the transformation of voltage from 10.5 kV to 0.60 kV and 0.4 kV for powering the junctions will be dry-type transformers. The selected size and number of transformers is determined according to foreseen loads in various operational regimes. In case one transformer fails, the other will be able to take over the failed one's load.

The transformers for powering the main technological junctions will be installed in transformer rooms in the new Unit's facilities.

6.12 UNIT CONTROL

CONTROL SYSTEM (DCS)
The distributed control system will ensure safe operation, adequate availability and economical operation, as well as low needs for operational and maintenance staff due to a high level of automation. Unit control requires an entire plant, including auxiliary facilities, which constitute a technological unit together with the main facility.

The system's main tasks include: automatic startup and shutdown of the Unit, automatic operation, automatic power changes, step power reduction, power limiting in case of aggregate failure, automatic switching of redundant aggregates, participation in secondary regulation frequency/power, maintaining voltage conditions with voltage control. A complete and well established thermal power plant control system, consistent with international and VGB standards, will be used.

The main facility control system (DCS) consists of the following main components: automation system, control and servicing system, bus system, engineering and archiving system. Redundancies in the control system will be used to increase the availability of the entire plant. Access to current and archive data of the central control system will be made possible through data exchange with intranet/ŠTPP processing network. Fail safe control in accordance with international standards will be used for burners and boiler and turbine protection.

The Unit's auxiliary devices with autonomous local control will be linked to the Unit control system through a peripheral data bus, in order to transfer the local control information into the main control system.

Control and servicing of the entire Unit will be performed through monitors in the Unit's command. Servicing stations for the boiler, turbine and Unit control areas are planned. Servicing from local sites is only planned for specific drives.

The following equipment will be serviced from the Unit command:
- Boiler
- Turbo generator
- Generator and switchyard
- Flue gas treatment plant
- Auxiliary equipment for ash removal, slag removal, coal transport, water treatment, thermal

station and other

PERIPHERAL EQUIPMENT
The following peripheral equipment will be connected to the DCS control system:
- Binary transmitters (contact level, pressure, flow and temperature transmitters)
- Analogue transmitters (resistance thermometers and thermocouples, pressure, flow, level and position transducters, analytical instruments)
- Configuration drives (regulation, open-closed drives)

Standard measuring signals will be used, predominantly live zero signal. Signal control will be applied to all analogue and binary signals (measuring range, interruptions and short circuit on the cable …) and the signal will be prepared for further use.

Priority will be given to the use of electric adjustment drives. The range of regulation and adjustment drives will be adjusted to the Unit's high level of automation.

Cabling to peripheral equipment through peripheral distributors will be carried out directly into the control system cabinets. Cable shielded against electromagnetic interference will be used. Peripheral equipment outside the main structure will be connected via surge protection. Connections to the switchgears will be made through standard point-to-point wiring.

6.13 CONSTRUCTION WORKS

The structures and infrastructure of Unit 6 will be constructed in the expanded ŠTPP industrial zone at the location where cooling towers of Unit 1 and 3 were standing, but had to be demolished and removed.

6.13.1 STATIC ASSESSMENT

The conceptual design in this phase of planning took into account all existing technical regulations and standards that apply to the territory of the Republic of Slovenia, as well as the following bases:
- Technological equipment data,
- The weight of the main technological equipment components, supplied by the mechanical part developer,
- Existing geotechnical reports on ground surveys and conditions of building foundations in the Šoštanj Thermal Power Plant (from UL, LMT – Prof. Sovinc, April 1979, to ZRMK, June 1995, and F. Vidic – GEOTEC, May 1998),
- Seismic project parameters for Šoštanj TPP.

The concept for the foundations takes into account the changing geotechnical characteristics of the underlying soil from South to North. The basement structures south of the so-called break-off edge will be founded on a good load-supporting marl base. All heavier equipment elements and structures without basements that lie south of the break-off edge will be constructed on a fortified gravel buffer, which will extend to the depth of the good load-supporting marl base. Building foundations for structures and equipment north of the break-off edge will be more challenging due to the rapidly changing conditions. The differences will be partially compensated with varying thickness of the well-fortified gravel fill. The planned thickness of the fill ranges from 1.0 m on the south side to 2.5 m on the north side of individual structures. The exact thickness will be determined by a geotechnical engineer before the excavation. If the excavation reveals geotechnical conditions which are worse than expected, the ground can be modified with, for example, JET GROUTING pilots.

The data on expected vertical and horizontal foundation floor deformation will need to be taken into account during the construction of all foundations.

6.13.2 DESCRIPTION OF THE FACILITIES

6.13.2.1 Main Power Facility – MPF

The main power facility (MPF) consists of a machine room, bunkers and a boiler room. The location of the main power facility is proposed to be within the area to the west of the existing main power facilities of Units 1 - 3 and south of the cooling tower of Unit 4. The cooling towers of Units 1 and 3, currently situated in this location, will have to be demolished and removed.

Engine Room – UMA

The engine room is situated to the east of the main power facility. It is designed as reinforced concrete skeleton with a steel latticed roof construction. From a constructional point of view, the building is partially self-supporting and has its own foundations on the east side, while the west side leans against the main columns of the bunker facility.

The ground plan dimensions will be 94.50 x 47.00 m and height above ground level will be 37.50 m. Foundation height is 5.80 m below ground.

The turbine will be installed at the height +15.00. The turbine foundation lies on springs, which prevent the transmission of vibrations to the other parts of the structure. A crane with a load capacity of 1700 kN is planned for the engine room.

The roof is constructed of HI-bond sheets made of light concrete with suitable hydro-insulation and protection. Facades are lined with composite trapezoidal sheet metal with required heat and noise insulation.

Bunker Facility – UHF

The bunker building is located between the engine room and the boiler room and is a stand-alone building. Elements of the engine room structure on one side and of the boiler room on the other side lean on the bunker building.

The ground plan size of the bunker building is 94.50 x 11.00 m, height above ground is 67.50 m, while the foundation height is 8.20 m under the ground level. The foundations of the building are a combination of pad and strip foundations.

The construction is a reinforced concrete skeleton with two series of pillars spaced 6.60 m apart in a longitudinal direction. Floor constructions are made of reinforced concrete at heights -4.00, ±0.00, +7.50, +11.75, +15.00, +21.50 and +42.00 m.

Heights ±0.00, +7.50 and +11.75 are intended for electrical equipment. Toilets and dressing rooms are also located at +11.75. A control room and other control units are installed on height +16.00. The control room is located at the (far) north part of the building due to fire safety reasons.

Coal bunkers are located between the heights +24.375 and +46.75, coal distributors are at +20 m. Height +46.75 m is designed for coal transport (bunker loading).

Access to individual floors is through two staircase towers, which also house elevators.

The roof of the building is flat, made of reinforced concrete with suitable hydro-insulation, and independently drained.

Boiler Room – UHA

The boiler room is made of steel. The roof of the bottom part of the structure, with floors between +0.00, +20.06 and partially +38.0 m, is at height +70.50 m. Ground floor dimensions of the bottom part of the boiler room are 78.90 x 67.90 m. The upper part of the structure, from height +70.50 to the top of the boiler (height +126.50 m) has ground floor dimensions of 54.00 x 46.00 m. At the centre, both the bottom and the upper part of the structure lean on the boiler structure, which also takes over all the horizontal loads.

The boiler room basement is at -4.50 m. It is designed for various installations, pipelines and access to the foundations of the mills and fans. The ash removal unit is located under the boiler. Water drainage on height -4.50 is performed with open channels, which lead to the technological sewerage system.

Height ±0.00 is constructed of reinforced concrete. 8 coal mills and fresh air fans are located here. The foundations of the mills lie on springs, preventing the transmission of vibrations to other parts of beton construction.

The roof at height +70.50 m is covered with HI–bond sheet made of light concrete with suitable hydro-insulation and protection. Water is drained from the boiler roof and boiler room roof via drain pipes next to the pillars of the boiler structure.

Exterior walls are lined with composite trapezoidal sheet metal. Exterior walls from height ±0.00 to height +15.00 must provide heat insulation and protection against noise generated by the mills at height ±0.00.

Besides the local staircases between individual floors, access to individual floors and the boiler itself is possible by two staircase towers. The height of the first is 57.6 m and it is used for communication purposes in the boiler room and bunker part only, the other is 135.9 m high and is used for access to individual landings on the boiler.

Electrostatic Precipitators – UHQ

The two electrostatic precipitators are proposed to be located between the main power facility and the desulphurisation plant.

The steel load-bearing structure of the electrostatic precipitators forms one part of the equipment; the calculations consider the possibility of an earthquake. Foundations are pad-type and joined with foundation beams.

Two flue gas channels run to the desulphurization plant from the electrostatic precipitators. The load-bearing structure of the flue gas channels is made of steel on reinforced concrete foundations.

The electrostatic precipitators plateau also houses draft fans in a roofed and closed room sized 15.0 x 62.58 x 11.0 m. Flue gas recirculation fans are located at height +27 m in the boiler room. The foundations of the draft fans are on springs. The load-bearing structure of the fan enclosure is made of steel. Roof beams rest on the steel load-carrying structure of the electrostatic precipitators on one side and on the load-bearing structure of the desulphurisation plant building on the other side. The enclosed room with composite trapezoidal facade lining assures appropriate noise protection.

Desulphurisation Plant – UVG

The main process building for the desulphurisation equipment has ground plan dimensions of 33.0 x 36.0 m. On the south side a stair tower is located, with a lifting shaft which has dimensions of approx. 6 x 6.5 m. Heights of the building are different. Part of the building has a roof at the height of +18.30 m, another part at height of approx. +48.70 m. Stair tower has roof at the height of approx. +50.00 . All columns are knuckle based at the height -0.85 m.

Supporting steel structure is formed by transverse frames and vertical strengthening frames. For the purpose of the used technology, floors are implemented at different heights. The location of individual items is visible in the static calculation. Hot-rolled IPE and HEA profiles of different dimensions are used for frames and square tubing of various sizes is used for strengthening the construction. Elements are screwed to each other. Connections to the foundations are knuckled.

In the northern part of the main process building there is an AB stair tower in which the height +1.20 m there are places for two transformers, at height +7.00 m there is place for wardrobe, at +9.80 m there is room for the toilet and at +12.00 m there is a planned place for command booth during the start-up experiments.

The base plate of the scrubber has a base thickness of 1.65 m. The bottom of the plate is at -2.50 m, the height of anchoring steel structure of the process building is at - 0.85 m. In point A5, B5, A4 and B4 it will be necessary to increase the thickness of the plate by 45 cm, in a floor plan manner below the columns 2.0 x 2.0 m, due to a substantial divergence of size of the pressure forces as compared to the other pillars. Stand under the scrubber and other reservoirs has thickness of 2.60 m.

Compressor Station

The compressor station is a component part of the flue gas desulphurisation structures for of Unit 6. It is located next to the electrostatic precipitators and designed for the installation of five compressors. Ground plan dimensions are 23.10 x 8.20 m and height is 11 m.

The structure is planned to be made of reinforced concrete, mainly due to the requirements regarding noise protection. The structure will be equipped with a bridge crane with a 30 kN load capacity. The main structure consists of a roof plate on roof rails, walls and strip foundations. Each compressor has its own foundations.

6.13.2.2 Silos

Gypsum Silo – UVH

In the floor plan the gypsum silo is designed as a cylinder with outer diameter of 19.20 m. Cylinder has an added rectangle, in the floor plan view, for the needs of staircase and has dimensions 5.60 x 5.95 m. At a height of +33.00, the cylinder turns into a rectangle of dimensions 19.20 x 24.20 m.

Building's height is divided into four levels. The lowest part of the building is at height of -1.85 m and the highest part of the building is at height of +44.05 m. By the height of 33 m, the object is made as monolithic AB object. Above this height is the last floor, which is made of steel profiles and coated with tin sandwich panels.

Electrostatic Precipitators Fly Ash Silo – UET02

The floor plan of the facility is designed as a cylinder with outer diameter of 12.50 m. Rectangle is added to the cylinder for a staircase and the dimensions are 5.80 x 2.90 m. Up to +25.80 height the object is made as monolithic AB object. Up to 53.30 m height the object is planned to be done in a stainless steel version.

Building height is divided into four levels. The lowest part of the building is at the height of -1.85 m, the highest part of the object is at height of + 53.30 m.

Slag silo – UET01

The floor plan of the facility is designed as a cylinder with outer diameter of 9.90 m. Rectangle is added to the cylinder because extra space is needed and the dimensions of it are 5.10 x 3.65 m. Up to height of +12.50 m the object is designed as a monolithic AB object. Up to the height of 27.00 m the object is planned to be made of steel.

Building height is divided into four levels. The lowest part of the building is at the height of -1.85 m, the highest part of the object at the height of +27.78 m.

6.13.2.3 Coal Transport Facilities

Coal is transported on the existing inclined conveyor bridge. The plan includes the construction of a new inclined conveyor bridge 6 UED 02, running from the bottom sifting station 6 UED 01 to the corner sifting station 6 UED 03. A new bridge between the corner sifting station and the new bunker building, leaning on the longitudinal wall of the engine room, is also planned.

Bottom sifting station – 6 UED 01

Floor plan of the station is of rectangular shape of dimensions 15.1 x 14.0 m (axis spacing). The primary load-bearing structure has the shape of a frame in both directions. Pillars support the floors at height +3.08 m, +9.08 m, +11.88 m +17.88 m. On the ground floor, walls are made of reinforced concrete between the columns of frames, which serve as strengthening for the vertical connection and at the same time provide increased stiffness of the first floor level, to which both transport bridges are connected. Connections of main secondary carriers of the technology equipment are planned to be knuckled. Columns and beams are planned to be made from hot-rolled I profiles (IPE, HEA), roof beams and diagonal support beams are planned to be made from box profiles (square tube). Load-bearing structure of the floor at height of +3.08 m is made of AB panel with height of 15 cm, which is cemented onto the HI-BOND tin plate t = 8mm. The panel is supported by steel profiles, which run in distances of less than 2.00 m from each other. Steel construction is covered with a roof and façade insulation coating. The roof is made as a gable roof with a pitch of approx. 8 °. For cladding the roof and façade sandwich insulation panels are planned. The object is founded in a shallow manner, with system of strip foundations, which are, at the height of 0.00 m, connected with the base plate. Between the axes A and B under the building, an AB tube is placed, which is integrated into the basic structure. The facility is based on the height of approx. -2.00 m.

Inclined conveyor bridge – 6 UED 02

The bridge 6UED02 connects sifting stations 6UED01 and 6UED03. Beginning of the bridge is at the height of 4.70 m, and ends at a height of 36.30 m. Horizontal length between extreme points is about 106.8 m. The bridge is divided into four sections. Horizontal length of the sections is about 26 m. Sections are supported by steel supports on concrete foundations. The axle width of the bridge is 4.7 m, the bridge clearance height is approx. 2.2 m.

Corner sifting station – 6 UED 03

The sifting station UED03 is designed for installation of equipment to carry out the change in the direction of transport. It supports bridges UED04 and UED02. The lower part, up to height of +34.0 m is made of concrete construction of floor plan dimensions 5.00 x 5.00 m. Above this height is a closed steel construction - porch that protects equipment against environmental influences. The construction of the porch is made of steel profiles. Porch floor plan dimension is 12.0 x 12.0 m and a height of 10.0 m. Total height of sifting station is 44.00 m above ground.

Inclined conveyor bridge - 6 UED 04

The bridge 6UED04 connects sifting station 6UED03 and the top of the bunker for shaft coal 6UHF. Beginning of the bridge is at the height of 35.85 m. It ends at a height of 46.0 m. Horizontal length between extreme points is about. 58.56 m. The bridge is divided into two sections. Horizontal length of the first section is about. 13.56 m and spans the distance between sifting station 6UED04 and carrier frame of the engine room, where it represents a fundamental intermediate support. The second section, which is approx. 45.0 m long, goes from the support to the bunker part. The axle width of the bridge is 4.9 m, the bridge clearance height is approx. 2.2 m.

6.13.2.4 Slag transport – UEU01 and product transport – UEU02

Slag and product/residue are transported with conveyor belts to the existing interim depot. The load-bearing structure is made of steel latticed roof rails and pillars on reinforced concrete pad foundations.

6.13.2.5 Transformer Plateau and Switchyard

Transformer Plateau – 6 UBF

The transformer plateau is located south of the main power facility building, close to the engine room. Four transformers are installed here: block transformer 400/21 kV, 710 MVA, two transformers for own use 21/10,5 kV, 70/40/45 MVA and reserve transformer 115/10,5 kV, 40 MVA.

Foundations of the transformers are made of reinforced concrete, formed into a collection container at the top. Drainage is performed through an oil pit (separator), capacity 100 m^3, located on the west side of the foundations. A firewall (F 90), height ca. 8.0 m, is planned between the two transformers.

Between the transformation plateau and the 400 kV GIS switchyard, a covered cable tube with internal dimensions 0,90 x 1,5 m and 1,70 x 2 m is planned. Prefabricated lids for the tubes will be designed to withstand heavy traffic loads.

Switchyard - UAA

As part of the implementation of the entire block 6 TES facility, a GIS switchyard will be built next to the existing 400 kV switchyard of Unit 5. Switchyard facility has floor plan dimensions of 18.20 x 12.40 m. Height is divided into two floors, basement and ground floor. The lowest part of the building is at height of -3.75 m and the highest part of the building is at height of +11.33 m.

The basement of the facility is made of monolithic reinforced concrete, while ground floor is made of steel skeleton and coated with AB sandwich panels fixed to a steel structure at the height of 3.0 m.

GIS switchyard will consist of 400 kV GIS field, through which block 6 will be connected to 400 kV line TEŠ-Podlog, and four 220 kV GIS fields. Two 220 kV transformer fields will be used for connecting blocks 4 and 5, one field for switching 220 kV transmission line TEŠ-Podlog, as well as one measuring field. All elements of the 400 kV and 220 kV GIS switchyard will be typical and with the same technical characteristics that are commonly used in 400 kV and 220 kV Slovenian transmission network.

Cable between the block transformer of Unit 6 and 400 kV GIS field will be placed in the bottom of the cable tube and the connection between the 400 kV GIS field and the existing portal for 400 kV transmission line will also be implemented with cable. Also all cable connections between the transformers of blocks 4 and 5 and 220 kV GIS switchyard will be done with 220 kV cables in the cable tube. The connection between the reserve transformer and existing 110 kV GIS switchyard will be carried out with 110 kV cable, which will be partially loaded in a tube together with the 400 kV cable, and partially on the cable shelves on the retaining wall.

In the ground floor of GIS switchyard, cabinets for local control and protection will be installed in addition to the switch fields.

6.13.2.6 Water Preparation Facilities

Crude Water Pumping Station – UGA

The structure is located by the Velenje–Šoštanj road, next to the entrance into the Šoštanj Thermal Power Plant complex. It is connected to the existing pumping station, through which water inflow is directed as well. The structure supplies water to the system for cooling water preparation (decarbonisation).

Ground plan dimensions of the structure are ca. 14.0 x 8.0 m. The structure is designed as a reinforced concrete skeleton above ground. The pillars are monolith reinforced concrete pillars, dimensions 30/30 cm, connected by horizontal reinforced concrete links. The roof is designed as a 20 cm thick flat reinforced concrete plate. The structure extends ca. 5.0 m underground, where the base is also made of reinforced concrete. Wall thickness is 40 cm. The structure's foundations lie on a 1.0 m thick stabilized buffer.

The facade is thermally insulated and plastered with mineral plaster. The roof of the structure is flat with minimum inclination, thermally insulated and covered with welded hydro-insulated sheet metal.

Decarbonisation structure – UGB

The structure is located north of the existing decarbonisation unit. It is designed as reinforced concrete structure, which is divided into two parts by means of dilation. The floor plan of the object is in the form of 'L' and the dimensions are 12 x 16,25 m for the eastern part and 23,15 x 11,8 m for the western part. Maximum height of the object is +10,30 m. The main load-bearing structure consists of the walls, linked to internal pillars and supports with plates. Wall thickness above ground is 20 cm and 30 and 40 cm underground. The thickness of the foundation plate is 40 and 50 cm.

The structure consists of two separate parts:

- the larger part has a decarbonised water basin beneath the ground level,
- the smaller part has pumps and a compressor station beneath the ground level.

Most of the facade is thermally insulated and plastered with mineral plaster. The roof of the structure is flat with minimum inclination, thermally insulated and covered with welded hydro-insulated sheet metal.

Reactor – UGL and Sedimentation Tank – UGP

The reactor and sedimentation tank are located by the road Velenje–Šoštanj, next to the northern part of the ŠTPP complex. The sedimentation tank mechanically purifies the waste water which is then delivered into the reactor as crude water, where the decarbonisation process is performed.

Reactor will be shaped as a circular basin covered with a steel structure. The reactor diameter will be 25 m. The structure's foundations are built on a gravel buffer, about 1.5 m thick (in case it is established that the terrain's load-bearing capacity is lower than 100 kN/m^2, the ground has to be additionally stabilised). The roof is made of trapezoidal sheet metal.

reactor:
- The floor plan of the facility is designed as cylinder of diameter of 28.40 m
- Maximum height of the building is at the relative height of +12.30 m

settler
- The floor plan of the facility is designed as cylinder of diameter of 17.70 m
- Maximum height of the building is on the relative height of +12.30 m

6.13.2.7 Cooling Tower – URA

The cooling tower is a technological – functional unit, structurally composed of two separate structural elements: the shell or jacket and the spray zone.

The cooling tower jacket is a monolith reinforced concrete shell of hyperboloid shape. The total height of the cooling tower is 162 m, where the bottom part, planned to be constructed with inclined reinforced concrete pillars, is 9.7 m high, while the top part is the actual cooling tower shell. The jacket pillars will be prefabricated reinforced concrete pillars. At the bottom they will be fixed into a circular reinforced concrete foundation ring and at the top into the initial – lower – reinforced section of the shell. The foundation shall be made on the connective beam with pilots Benoto Ø118 at height 361.80.

On the south side the foundations are to be built directly on the marl base, and at north side through an interim construction on a connective shaft of Ø 118 Benoto piles at height 358.20.

The cooling tower will also be equipped with an appropriate aviation signalling system and lightning and grounding installation.

The cooling tower spray zone consists of reinforced concrete structures (monolith or prefabricated), piles and engineering equipment, designed for water distribution and water cooling. Foundations of the vertical support pillars and support »A« frames for radial distribution channels of hot water of the vertical inflow shaft are designed on Ø 60 »Benoto« piles, which are connected with reinforced concrete links beneath the bottom of the basin.

The engineering equipment of the spray zone consists of: drift eliminators, a system for distribution of warm water, and PVC cooling fills for heat exchange.

The collection basin for cooled water is designed to be made of watertight reinforced concrete MB40. Adequate dilatations will be performed with dilatation inserts, »FRANK« type, in order to achieve constant water-tightness of the basin.
An exhaust channel, supported by a support structure in the cooling tower shell and by the central tower load support, leads from the flue gas desulphurisation plant into the cooling tower. The channel is made of reinforced plastic.

6.13.2.8 Ammonia Storage Facilities

Ammonia Solution Warehouse – UTKO1 to UTKO4

The warehouse is designed for the supply of the ammonia solution by railway tankers and road tankers. The location of the warehouse is proposed at the east side of the power plant, north of the desulphurisation plant of Unit 5. The main components of the warehouse are:

- tank wagon refill station – UTK01
- road tanker refill station – UTK02
- pumping station – UTK03
- ammonia solution storing tank, above ground – UTK04
- drainage tank for emptying individual parts of equipment, underground.

The design of the transport routes within the warehouse enables railway engines to drive train compositions into the power plant premises, while subsequent handing will be performed with a local shunting engine. The handling will be performed on two existing railway tracks. The first, running beside the cooling tower of Unit 5, is designed for loaded wagons, and the second, running north of Unit 5, for empty wagons.

Ammonia Solution Pumping Station – UTK 03

The pumping station will be located north of the desulphurisation plant of Unit 5 and south of the main coal transport reloading station. The pumping station is designed as classical object with rectangular shape and floor plan dimensions of 10 x 10 m. It has one floor only, which will extend 1.50 m into the ground. The highest point of the object is at height +5,4 m.

Ammonia Solution Tank – UTK 04

The ammonia solution tank is a steel reservoir with a double tank. The reservoir is founded on AB base panel. The outer dimensions of the reservoir are: diameter 6,5 m and height 11 m.

7 NATURAL RESOURCE AND ENERGY SUPPLY

7.1 RAW MATERIAL SUPPLY

7.1.1 COAL

The use of coal from the Premogovnik Velenje coal mine is planned for Unit 6. The Velenje coal mine has committed to extract 4,000,000 tons a year until 2020 (this quantity includes the potential quantity of coal required for the operation of Unit 5), after which the planned coal mining will decrease until it reaches 2,000,000 tons a year in 2040. The projected price of coal is based on a tripartite contract between HSE, ŠTPP and Premogovnik Velenje coal mine. With this contract, the Velenje coal mine has committed to maintain the price of coal at 2.25 EUR/GJ in 2015. With an official letter dated 29 January 2009, the Premogovnik Velenje mine stated that the above-mentioned price (2.25 EUR/GJ) will be achieved with an average calorific value of 10.47 MJ/kg.

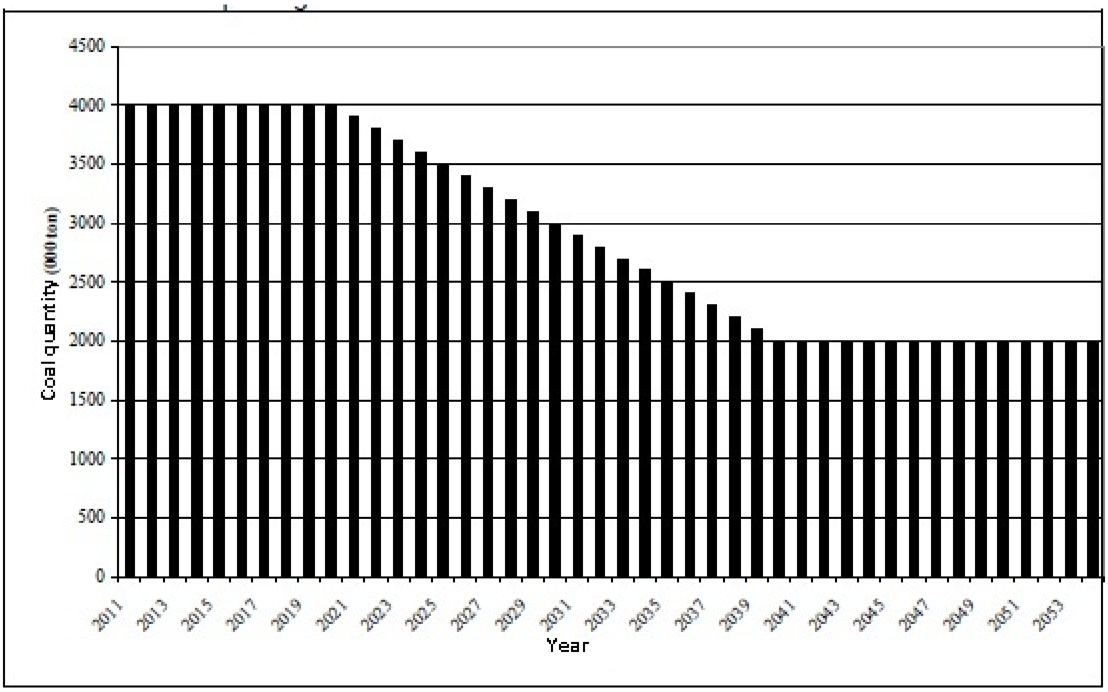


Image 7.1: Coal balance until 2054

The coal production dynamics presented in image 7.1 are seemingly unusual; however, the following objectives from documents were taken into account when planning the production of coal and operation of the replacement Unit 6 ŠTPP:
- Policies of transitioning to a low-carbon society after 2050
- Closing Premogovnik Velenje coal mine without a special law or capital subsidies
- Operation of replacement Unit 6 ŠTPP in full power mode

In the middle of the next decade, the production of coal in the Velenje mine will begin to decrease and will decrease rapidly until 2041, after which it will remain at the level of 2 million tons until the end of the service life of replacement Unit 6 ŠTPP. This will also contribute to reaching the goal of transitioning to a low-carbon society. This transition may be faster due to the project if CO_2 capture and storage technology advances and becomes commercially interesting within the next twenty years. However, it is important to stress that the transition to a low-carbon society will not be possible only by implementing measures in the field of electricity production from fossil fuels, as most emissions are generated in other fields.

The advantage of the replacement Unit 6 ŠTPP is that we can outline the gradual cessation of coal mining in the Šaleška Valley today. The production dynamics allow keeping the coal mine operating on a sustainable minimum in its last decade, providing it with the option of adapting its personnel structure as well as the extent of its investments. The trend of decreasing the quantity of mining spaces and automation of the work process will not only contribute to the maintenance of the agreed price of the energy source, but will also facilitate closing the mine. It will probably be necessary to join the Premogovnik Velenje coal mine with ŠTPP in the last decade of the mine's operation, in order to allow the closing of the mine without a special law, as it was done in the case of Zasavje. Until now, the closing of the Rudnik Trbovlje Hrastnik mine has cost the taxpayers around 160,000,000 EUR (in accordance with laws from 2000 on). This is undoubtedly a great comparative advantage of this project. The Šoštanj energy location will remain even after 2050, but we do not dare predict the type of production and the energy source used.

The production dynamics outlined in this programme also determine the operating regime of replacement Unit 6 ŠTPP. Despite reducing coal production, Šoštanj will still operate in full power mode with the objective of achieving high efficiency; however, the number of operating hours will be reduced.

The characteristic data for lignite are as follows:

Data	Unit	Guarantee	Range
Moisture:	%	37.5	35.8 – 40.7
Ash:	%	16.7	13.0 – 20.3
Combustibility:	%	45.8	41.5 – 48.9
Sulphur:	%	1.41	1.1 – 1.6
Calorific value:	MJ/kg	10.47	9.4 – 11.5

7.1.1.1 AVAILABLE COAL RESERVES IN PREMOGOVNIK VELENJE COAL MINE

Studies on coal reserves in the Premogovnik Velenje mine have been made since 1960. In the studies, the available coal reserves are recalculated each time based on existing and newly acquired data. Premogovnik Velenje sends these studies to the governmental Commission for determining reserves and sources of mineral resources under the Ministry of the Economy, which is the competent ministry for the mining industry. The method of preparing these studies is defined in detail in the Rules on classification and categorization of solid mineral reserves and resources.

According to data from the document entitled "Planning the production and quality of coal for the supply of Unit 6 (initial state 1 January 2011)" (Velenje, 26 November 2010), the following is worth emphasizing:

a) The Premogovnik Velenje coal mine development plan for 2010 – 2027 is fully in line with AIP 3 (the assumptions in AIP 4 are almost identical to those in AIP 3), which projects a gradual decrease of production, allowing for optimal adjustment regarding the excavation front, work processes, the number and length of mine cave routes and facilities, and the number of employees. This plan projects the production of coal in the amount of ca. 40 million tons/year until 2020 (3.0 million tons/year for Unit 6), after which production will gradually decrease and amount to ca. 3.2 million tons/year in 2027 and reach ca. 2.0 tons/year in 2040 until the end of the exploitation (See Image 7.3).
b) According to the data from the document "Projection of physico-mechanical parameters and calorific value of lignite by 2028" (study 02/07-HGS, Velenje, February 2007), it can be established that a new excavation dynamics concept was finished in 2010 (study "The concept of mining cave development in Premogovnik Velenje coal mine", study No ŠK 001/10, Velenje, 6 May 2010), where the excavation dynamics take into account the operation of Unit 6 ŠTPP.

To ensure the necessary production, simultaneous operation of only two more than 200 meters wide excavation panels is planned.

c) The “Certificate on the reserves and sources of mineral resources”, issued by the Ministry of the Economy, Energy Directorate (No 3611-3/2010-2, date: 31 March 2010) states that the coal reserves in the Premogovnik Velenje coal mine on 31 December 2008 were as follows:

Table 7.1: Data on reserves in Premogovnik Velenje coal mine on 31 December 2008

Reserve category	RESERVE (in tons)				
	BALANCE	CONTINGENT BALANCE	OFF-BAL-ANCE	TOTAL	EXCAVATION
A	7,729,050	-	-	7,729,050	6,529,000
B	163,270,950	-	209,000,000	372,270,950	125,141,000
C1		-	-	-	-
A+B+C1	171,000,000	-	209,000,000	380,000,000	131,670,000
SOURCES C2					

Source: Certificate on the reserves and sources of mineral resources, Ministry of the Economy, Energy Directorate, 31 March 2010

A, B and C1 reserves are determined by detailed geological surveys. Depending on the degree to which they have been studied and on the level of the quality of the mineral resource, they are classified as categories A – proven reserves, B – researched reserves, and C(1) – insufficiently researched reserves (Rules on classification and categorization of solid mineral reserves and resources, OG RS No 36/2006, 6 April 2006).

d. The projected average calorific value of coal is 10.47 MJ/kg (in accordance with data from study 02/07 HGS – “Projection of physico-mechanical parameters and calorific value of lignite by 2028” – see item e) in the section Calorific value of coal in Premogovnik Velenje mine), the moisture content is 35.23 %, ash content 15.87 %, sulphur content (total) 1.39 % (0.91 % combustible and 0.48 % incombustible).

e. If we consider that the excavation reserve on 31 December 2008 was 131,670,000 tons, we can establish that:

- Considering that coal production in the Velenje mine was ca. 4.0 million tons/year in 2009 and 2010, we may conclude that the excavation reserve at the end of 2010 was around 123,000,000 tons.
- In regard to the findings from the previous point, the document “Revision of coal reserves in Premogovnik Velenje coal mine based on conceptual solutions until the completion of excavation at the Velenje excavation site” (University of Ljubljana, Faculty of Natural Sciences and Engineering, January 2009) should also be mentioned. The conclusion of this document on page 22 states: “According to confirmed concepts, around 75 million tons of coal can be excavated from the mines of Premogovnik Velenje. An additional 49 million tons of coal will be acquired from ‘bound reserves’ through the existing method of excavation. Altogether, 124 million tons of coal can be obtained from the Velenje section of the Premogovnik Velenje mine. The state of reserves on 31 December 2008 was taken as the basis for calculating coal reserves until the end of the exploitation of the Velenje excavation site. It is important to remember that there is an additional 90 million tons of coal in the Šoštanj section of the deposit in the Šaleška Valley, and it is estimated that around 60 million tons of it could be excavated. Premogovnik Velenje has temporarily terminated the exploitation of this section of the mine. By using conventional excavation methods and the demand for excavation without subsidence, the exploitation of this coal would not be economically viable …”

- If we consider the projected operating regime of Unit 6 within its service life, we can estimate that around 95,000,000 tons of coal will need to be provided. It is also planned to keep Unit 5 as a cold reserve until 2027 with a maximum output of 1,055 GWh, which means, in an extreme case, that an additional 17 million tons of coal would need to be secured for the requirements of U5. It is clear from the provided information that the available excavation reserves in Premogovnik Velenje mine suffice for normal operation of Unit 5 and (especially) Unit 6 in ŠTPP within their projected service life.
- The image below will illustrate that the coal reserves are sufficient until the end of 2054 or the end of the service life of Unit 6. It should be taken into account that these are approximate estimates of annual production and that the maximum operation of Unit 5 of up to 1,055 GWh/year is also taken into account. Consequentially, the remaining quantity of coal would be greater at the end of the service life.

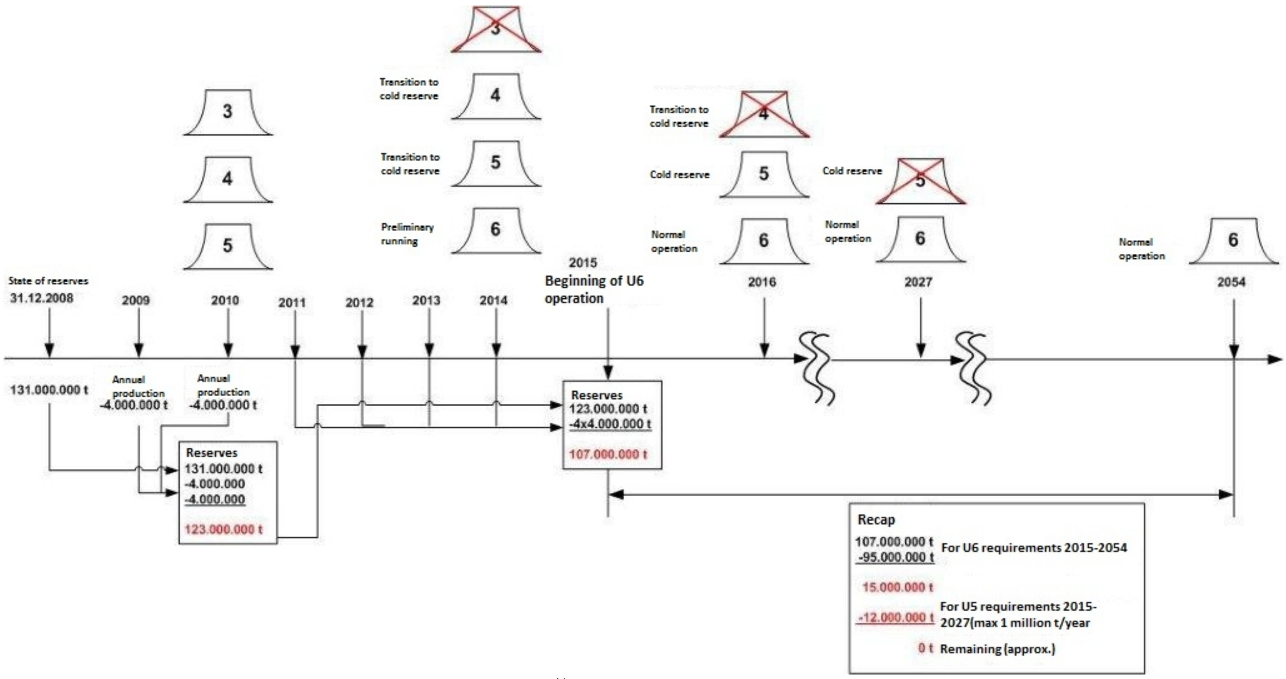


Image 7.2: Schematic diagram of the operation of ŠTPP units and the consumption of coal/coal reserves in the Premogovnik Velenje coal mine

The following should also be highlighted:

Due to expressed doubts regarding the quantity, price and (especially) calorific value of the coal in the excavation reserves, a study was prepared at the request of the supervisory board of HSE d.o.o. by the company DMT IMC Montan Consulting from Germany, which performed an independent verification of data regarding quantity, projected price and quality of coal in the excavation reserves of Premogovnik Velenje coal mine and established the following:
- Excavation reserves at the end of 2010 amount to 124,000,000 t with balance reserves in the amount of 162,000,000 t, which is in accordance with the planned production of 123,000,000 t from 2011 to 2054. There is a chance of an additional decrease of excavation losses and a consequential increase of excavation reserves.
- Careful planning of mining for the projected quality of coal and constant supervision and monitoring ensure the same level of calorific value in coal production in the future for many years in advance.
- Production costs do not show specific differences when compared to similar underground exploitation of coal around the world, and there is sufficient evidence to show that Premogovnik Velenje can achieve the planned coal price per GJ of energy.

The findings of this study confirm the assurances of the Premogovnik Velenje mine regarding quantities, calorific value and possibility of achieving the target price of coal.

7.1.1.2 CALORIFIC VALUE OF COAL IN PREMOGOVNIK VELENJE COAL MINE

According to the information in the study 02/07-HGS "Projection of physico-mechanical parameters and calorific value of lignite by 2028" (Velenje, February 2007), it is worth to emphasize the following:

a. The projection of coal quality and other physico-mechanical and chemical parameters for mining from 2007 to 2028 is based on long-term excavation concepts "Excavation concept for the mine Pesje from k. -40 to the depression bottom and CD pillar" (study No. TK001/06) and "Supplement of the concept of exploitation of the north-western and central section of the mine Preloge" (No. RP-183/2000 ML).
b. Values of individual parameters are determined by a grid of symmetrical points on individual excavations and mass balance following the procedure "Classification of coal beds based on calorific value and geomechanical properties of the overlying rock". Input data for processing have been prepared based on a geological database and verified geological profiles: caprock height, 7.5 MJ/kg quality limit height, and surface height. Variations are possible in areas of larger geological anomalies and peripheral conditions. Those areas are additionally researched before excavation.
c. Physico-mechanical and chemical parameters for individual excavations, mine sections, as well as for the Premogovnik Velenje as a whole are calculated based on a geometric method, which means that they are based on a mass balance given as a function of estimated production for individual excavation plates, where excavation losses have already been taken into account.
d. According to the above-mentioned plan and regarding the period under consideration, it is planned that the largest share of production will be provided from the Pesje mine (ca. 68.23 %), followed by the Preloge-North section (14.8 %), Preloge-CD (ca. 12.7 %) and the least from the section Preloge-South (ca. 9.19 %).
e. It is anticipated that coal with an average calorific value of 10.37 MJ/kg will be acquired from the Pesje mine, coal with an average calorific value of 9.9 MJ/kg from the Preloge-South mine, coal with an average calorific value of 10.89 MJ/kg from the Preloge-North mine, and coal with an average calorific value of 10.92 MJ/kg from the Preloge-CD mine. **The total average calorific value of coal from the Premogovnik Velenje mine will therefore be 10.47 MJ/kg.** It is anticipated that ca. 85 million tons of coal will be mined in the 2007–2028 period, and that its calorific value will range between -16.88 % and +11.26 % in regard to the estimated calorific value.
f. According to the information from the document "Planning the production and quality of coal for the supply of Unit 6 (initial state 1 January 2011)" (Velenje, 26 November 2010), it should be stressed that the lower limit for planning the excavation in Premogovnik Velenje is calorific value of 8.4 MJ/kg. The calorific value of coal in the layer increases linearly towards 13 MJ/kg from the footwall to the hanging wall. To ensure average calorific value on an annual level, excavation dynamics are extremely important, and demands regarding the minimal average annual calorific value of coal as well as the total annual energy value are clearly defined by the user (ŠTPP).

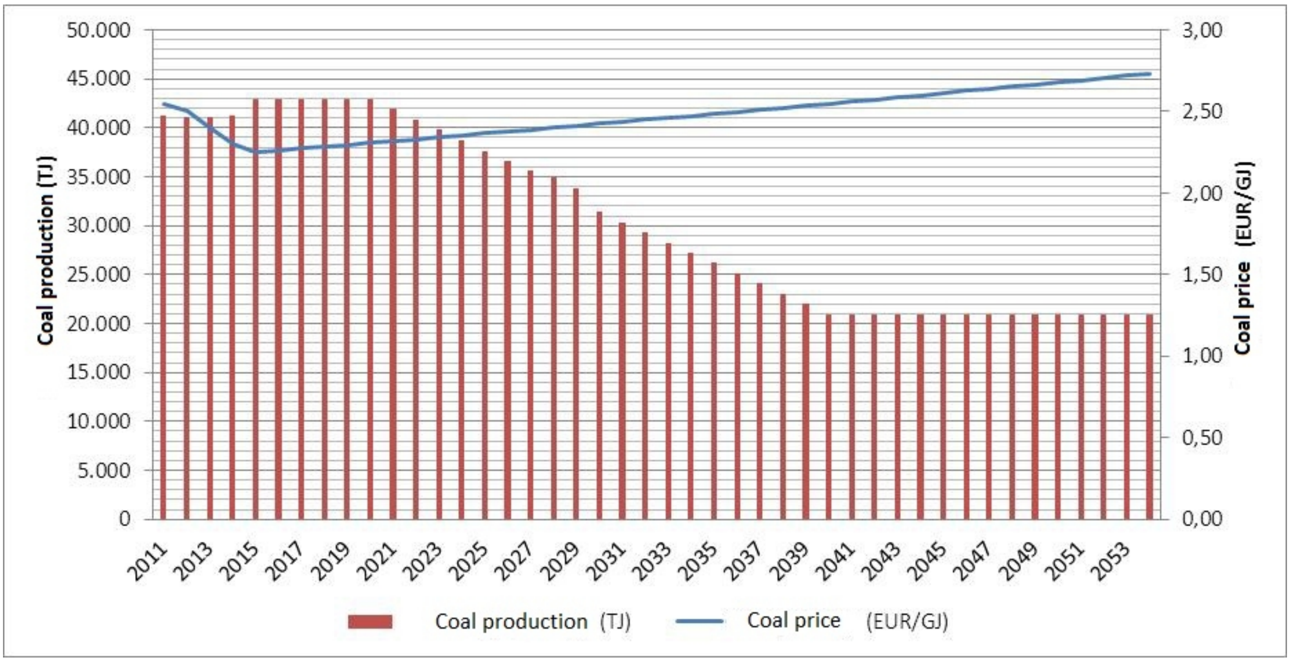


Image 7.3 Movement of the energy value and prices of coal produced in the Premogovnik Velenje mine

7.1.1.3 TARGET PRICE OF COAL IN PREMOGOVNIK VELENJE COAL MINE AND MEASURES FOR ACHIEVING IT

The Premogovnik Velenje mine has long been preparing intensively to ensure the conditions for a price of coal which will enable competitive production of electricity in Unit 6 of the Šoštanj power plant. To this end, it has been optimising the coal production process with constant rationalisations, which will contribute to decreasing the extent of the mine and the number of employees. In its Development plan, Premogovnik Velenje coal mine has projected gradual decreasing of the price from the current level to 2.25 EUR/GJ in 2015. All key development projects, which the Premogovnik Velenje mine is capable of carrying out on its own with the predicted price movement, will also be implemented during this time.

Production of coal in the amount of ca. 4 million tons a year is predicted until 2020, after that the quantity will gradually decrease to 3.2 million tons in 2027 and 2 million tons in 2040. The quantity will remain at 2 million tons annually beyond 2050. The price of coal which will ensure the competitiveness of Unit 6 has therefore been planned for a while and is projected in the applicable Premogovnik Velenje development plan for 2009 – 2018, as well as in the Premogovnik Velenje development plan until 2027. The price will reach 2.25 EUR/GJ in 2015. Because it is essential to establish consistency of the model due to using real price growth projected in the NEP draft, real price growth was used for coal as well. The constant price of coal at the beginning of 2015 will therefore be 2.25 EUR/GJ and it is projected to stay on the same level through the entire service life of the Unit 6 project. However, the model follows the projections from the NEP draft, which includes real economic growth; therefore, the price of coal is slightly higher and harmonised with economic growth. Thus, the increase effect is not due to inflation, but due to real growth which was also projected by the NEP draft. This method was used to avoid oversimplification.

Several projects and programmes are taking place in the Premogovnik Velenje mine to achieve further cost optimisation; three of those projects are particularly important:
- Decreasing the number of excavations due to increasing the width of the active mines, where a width increase to over 200 meters from 140 metres was achieved in the past two years.

- Work modernisation for preparing sites; that is, building mining routes and other required mining structures for coal production. The goal of this development programme is to optimise expenses as well as humanise work processes, ensure occupational safety and increase progress, which of course brings favourable economic results.
- Optimising the coal transport system from mining sites to the surface which requires the construction of a new NOP II shaft in the direct vicinity of the production process and significantly closer to the exploitation fields. The new shaft project will significantly shorten coal transport routes and consequentially lower the total number of mining sites and the associated operating and maintenance costs.

In the years when Premogovnik Velenje was producing over 5 million tons of coal per year, over 90 km of mining routes with a conveyor transport system for transporting coal from the mine to the surface were open. Due to some parts closing (primarily in the eastern part of the Šaleška depression) the extent of the mines has decreased to the present 50 km. All mining sites need to be ventilated, controlled and maintained daily. By optimising, the extent of the mining sites will decrease, operating reliability will improve, harmful effects on the environment (noise, dust) will be reduced and, most of all, operational costs will decrease in the following years. Due to shorter coal transport distances, fire prevention activities and related risks will also decrease.

In addition to the principal activity of coal production, the Premogovnik Velenje mine is intensely focusing on creating revenue from activities outside the coal industry. The number of employees in the coal production process will continue to drop, keeping the cost structure similar in the future.

In the period until 2015, the Velenje coal mine is planning intensive divesture of commercially unviable assets which it will no longer need for its operation. The sale of land which will become available after the NOP II shaft is constructed represents a significant share. In addition, activities are also aimed at increasing realisation in foreign markets, in SE Europe as well as beyond, which had already been successfully implemented for several years both in the Premogovnik Velenje coal mine as well as in the PV Group.
Both increasing other realisation as well as reducing costs leads to achieving the 2.25 EUR/GJ price of coal in 2015.

Table 7.2: Price of coal from PV coal mine during the service life of Unit 6

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Coal price (EUR/GJ)	2.55	2.50	2.40	2.30	2.25	2.26	2.27	2.28	2.30	2.31	2.32

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Coal price (EUR/GJ)	2.33	2.34	2.35	2.37	2.38	2.39	2.40	2.41	2.43	2.44	2.45

	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Coal price (EUR/GJ)	2.46	2.47	2.49	2.50	2.51	2.52	2.54	2.55	2.56	2.57	2.59

	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054

Coal price (EUR/GJ)	2.60	2.61	2.63	2.64	2.65	2.67	2.68	2.69	2.71	2.72	2.73

7.1.2 LIMESTONE

Ca. 130,000 t of ground limestone a year will need to be provided for the requirements of the desulphurisation plant, depending on the sulphur content in coal.

There are four suppliers of limestone flour in Slovenia, who are already supplying additives for the desulphurisation plants of Units 4 and 5. The suppliers have reserves in capacity available for increased demand, and are also willing to invest in capacity enhancement. Therefore, there should be no problems in limestone supply.

7.1.3. AMMONIA

For the needs of the plant regarding the catalytic reduction of NO_X in flue gases, ammonia in the form of 24 % ammonia water will need to be supplied. As there is no suitable supplier in Slovenia, the raw material will be imported from other EU member states. The annual demand is ca. 3,600 tons. The material will be stored in the central warehouse of the thermal power plant.

7.1.4 CHEMICALS FOR WATER PREPARATION AND WASTE WATER TREATMENT

Appropriate chemicals will need to be supplied for the preparation of process water and for waste water treatment. They are already supplied for the needs of the existing TPP, the quantity will therefore only increase after the construction of the new Unit. Supply does not present a problem.

7.1.5. FUEL OIL

Ignition firing for Unit startup will be performed with light fuel oil burners. The Unit will be supplied with fuel oil from the existing ŠTPP fuel tank. Unit 6 will be equipped with a 60 m^3 daily tank and installations required for supplying the oil burners. Up to 20 startups per year are foreseen, implying the use of about 600 t/year.

8 REQUIRED NUMBER OF EMPLOYEES

In order for the Unit to operate smoothly, operating personnel is needed to execute direct control of the Unit and the size of the staff is independent of the variant/size of the Unit. The staff consists of:

- Direct Unit personnel (unit manager, boiler and treatment plant operator, turbine operator, on-call locksmith, on-call electrician, boiler plant servicer, turbine plant servicer, treatment plant, coal transport and treatment plant product servicer)
- Water preparation personnel
- Coal transport personnel

Unit management is carried out continuously in 5 shifts, which requires (in accordance with the existing organisational scheme of ŠTPP) 70 workers, including unit, water preparation and coal transport managers.

Beside the listed personnel, the Unit also requires technological process control staff (process water, energy products, additives, by-products), management personnel (shift manager, operations manager) and Unit operation engineering staff (operations engineer and control and performance optimization engineer). That represents 10 people and is not bound to the shift system of the operating personnel.

We can conclude that 80 people directly linked to the Unit are required for its smooth operation.

The Unit's operation also demands staff for so-called logistical support of the Unit's operation (support-service and maintenance works). This staff is also essential for the Unit's uninterrupted operation, but it is not directly linked to its operations. This includes mainly the following support functions:

- Staff duty
- General HR
- Economic
- Technology and maintenance (engineers for particular sets of mechanical and electrical equipment and associated maintenance personnel, construction maintenance)

In accordance with the existing organisational structure in ŠTPP, the needs of these services demand 120 employees, with most of the personnel covering the technology and maintenance field (80 people), which ensures the maintenance of all equipment in perfect working order.

Considering the fact that Units 1–3 will permanently shut down before Unit 6 becomes operational, the existing operating personnel will be reassigned to Unit 6 and therefore no new employment is planned. Existing personnel will also be used for all supporting functions.

The management staff structure, as stated above, is in accordance with the existing organisational structure of ŠTPP, but with the goal of optimizing the Unit's operation by combining certain job positions (for example boiler section operator and FGD operator).

The construction of the new Unit with planned latest lignite-firing technology will require some new approaches in engineering, which will demand additional training of management and maintenance staff for the new Unit. The training will also be performed by equipment manufacturers and suppliers.

During the construction of Unit 6, all construction and assembly works will be performed under contract with equipment suppliers, who will also provide the staff necessary for the execution of these works.

Individual tasks, which will be executed by the investor himself in accordance with the contracts, will be performed by the existing personnel. Therefore, no new employments are foreseen for any of the phases of construction and operation of Unit 6.

The predicted 200 employees for the operation of the 600 MW Unit 6 are entirely within the range of the current staff numbers in standard fossil fuel thermal power plants all over the world.

8.1 NUMBER OF EMPLOYEES WITH AND WITHOUT THE INVESTMENT

No. of employees	2011	2012	2013	2014	2015	2016	2017	2018
With investment	451	421	396	396	396	396	371	366
Without investment	447	416	391	383	370	343	325	311

No. of employees	2019	2020	2021	2022	2023	2024	2025	2026
With investment	351	341	330	320	310	300	290	280
Without investment	297	278	257	241	223	203	189	177

No. of employees	2027	2028	2029	2030	2031	2032	2033	2034
With investment	260	200	200	200	200	200	200	200
Without investment	164							

No. of employees	2035	2036	2037	2038	2039	2040	2041	2042
With investment	200	200	200	200	200	200	200	200
Without investment								

The number of employees without the investment only accounts for the natural outflow of personnel – namely retirement.

9 LOCATION ANALYSIS

9.1 EQUIPMENT LOCATION

Preliminary studies have addressed various options for the positioning of the new Unit's structure into the available space. The only possible location for the new Unit is at the site of the existing cooling towers of Units 1 to 3, of which Unit 1 and 2 are already stopped and Unit 3 will be stopped in the coming years. The spatial possibilities only differ regarding the layout of the facilities.

When choosing the optimal layout, particularly the following criteria were taken into account:
- environmental requirements and restrictions,
- technological conditions for smooth and efficient operation of the new and the existing Units that will remain operational,
- technical conditions for the construction of new facilities,
- accessibility of facilities for maintenance and servicing,
- least disruptive integration into the existing environment.

The variants are listed according to the orientation of the main axis of the structure:

North-South: the engine room is leaning against the hill on the south side of the TPP, the boiler room and flue gas plant extend north towards the Paka river,

East-West: the engine room is standing on a plateau west of Unit 1, the boiler room and flue gas plant extend west in the direction of Šoštanj,

East-North: the engine room is standing on a plateau west of Unit 1 (as in variant E-W), the boiler room and flue gas plant extend north towards the Paka river.

The North-South variant is the least favourable, as it takes up all the available space between the hill to the south and the Velenje-Šoštanj road in the north due to the structure's great length. The desulphurisation plant is built right next to the road, which can be controversial.

The advantage of the E-W variant is in the intact location of the existing (and possible new) infrastructural facilities of the thermal plant in the direction of the Paka river, while the disadvantage lies in the cooling tower, which is slightly remote, located close to a hill. The possibility of constructing a cooling tower in this location is tested and plausible, the existing road to Lokovica will be routed on the plateau around the tower.

The advantage of the E-N variant is in the slightly more favourable location of the cooling tower, while the disadvantages include more challenging inner communication (maintenance) and required relocation of infrastructural facilities, for which little space is left.

In all three cases, the transformer plateau is leaning against the hill to facilitate the connection to the switchyard and the 400 kV power line.

Based on the discussions, East-West layout was chosen as the best possible solution; with the engine room on a plateau west of Unit 1, the boiler room and flue gas treatment facilities extending to the west towards Šoštanj, and the cooling tower shifted next to the hill.

The advantage of this layout is the construction of facilities in the flat area, except for the cooling tower, which is shifted to be next to a hill, on a plateau approximately 5 m above ground. This makes the construction slightly more expensive, but leaves more space in the flat area north of the new structure to facilitate further development of the TPP.

The structures will be so to speak leaning on the hill on the south side, making their appearance less intrusive. Noise propagation will be partially limited with natural barriers (hill, existing and new structures) and with the construction of noise barriers.

One of the advantages of this version is also the layout of the structures and technological equipment, which is practically standard. This means it is well-tested, controlled and optimized, which can make it more economical and available from a wider range of suppliers.

9.2 ADMINISTRATIVE PROCEDURE

The decision to build Unit 6 requires that the investor complies with the current legislation and state of implementation in the field of construction of complex energy generation facilities in the Republic of Slovenia.

In accordance with the Spatial Planning Act (OG RS 33/07) and the Decree on the types of spatial planning of national significance (OG RS 95/07 and 102/08) the construction of Unit 6 can be classified as spatial planning of national significance. Such an intervention requires a national spatial plan (NSP). The State has transferred the procedure of preparing the spatial planning documents to the Šoštanj municipality. Separate consideration of facilities within the existing ŠTPP industrial zone and facilities outside of this zone (cooling tower and smokestack) was agreed upon with competent ministries.

Spatial planning for the construction of Unit 6 is therefore regulated by two detailed municipal spatial plans (MSP): MSP for spatial planning of common concern for Unit 6 of ŠTPP with accompanying facilities was adopted in September 2007 and published in OG RS 88/07, MSP for spatial planning of common concern for the smokestack and cooling tower of Unit 6 of ŠTPP was adopted in June 2008 and published in OG RS 64/08.

In addition to the above-mentioned Environmental detailed spatial plans for the construction of Unit 6, TEŠ obtained all necessary approvals of relevant ministries by now. Key among them are:

a) Energy permit for 600 MW Unit 6 issued by Ministry of Economy 21 May 2006
b) Block 6 of 600MW in the Resolution on National Development Projects of the Government of Slovenia 12 October 2006
c) HSE Assembly (Government of RS), HSE's development plan, the confirmation of 600MW Unit 6 7 December 2006
d) Consent of Ministry of Economy for the EIB loan of EUR 350mio 27 June 2007
e) Initial approval of Ministry of finance for EIB loan of EUR 350 million 3 July 2007
f) "No objection letter" of the Government / Ministry of Finance for loan from the EIB - EUR 350mio 11 July 2007
g) Final consent of Ministry of Finance for the EIB loan of EUR 350 million 21 September 2007
h) Environmental consent issued by Ministry of Environment 11 November 2009
i) "No objection letter" of Government / Ministry of Finance for loan from EIB 440 + 110 million 18 March 2010
j) Consent of Ministry of Economy for the EIB loan of EUR 440 + 110mio 29 March 2010
k) Initial approval of Ministry of Finance for EIB loan of EUR 440 + 110mio 7 April 2010
l) Final approval of Ministry of Finance for EIB loan of EUR 440 + 110 mio 14 April 2010
m) Consent of the Ministry of Economy for EBRD loan of EUR 200 million 2 April 2010
n) Initial approval of Ministry of Finance for EBRD loan of EUR 200 million 7 June 2010
o) Letter of support of the Government of RS / Ministry of Economy on support for the EBRD 200 million EUR loan 21 June 2010
p) Final approval of Ministry of Finance for EBRD loan of EUR 200 million 31 December 2010
q) Environmental permit issued by Ministry of Environment 16 February 2011

r) Building permit for the cooling tower of block 6 issued by Ministry of Environment 16 March 2011
s) Building permit for a block 6 issued by Ministry of Environment 16 March 2011

10 ENVIRONMENTAL IMPACT

10.1 GENERAL

Lignite from the Premogovnik Velenje coal mine will be used as fuel in the new Unit. The unit is designed so that the negative environmental impact of its operation will in no case be greater than permissible. This means 100 mg SO_2/nm^3, 150 mg NO_X/nm^3, 20 mg dust/nm^3 and 250 mg CO/nm^3 (Environmental permit for Unit 6 of 16 June, OGRS 46/02 and 84/02, LCPD 2001/80/EC) in regards of air protection.

The plan takes into account the principle of the best possible integration of tested devices that meet the requirements of permissible environmental impact. By adding treatment plants and other technical measures, the new Unit will qualify for an environmental protection permit in accordance with the IPPC Directive.

Emission rates of the new Unit will be shown below based on the Unit being operational 6,650 hours per year (calculated based on full power).

10.2 AIR PROTECTION

10.2.1 DUST PARTICLE EMISSION

Dust particle emission from the new Unit will reach emission concentrations under 20 mg/nm^3 after the electrostatic precipitator and under 20 mg/nm^3 when exiting the desulphurisation plant. It will never exceed 35.4 kg/h or 235 t/year. Dust particle emission from other auxiliary equipment (limestone flour silo, ash silo, gypsum silo, transport equipment) will be harmonized with applicable regulations for units such as this one. Currently allowed emission concentrations for dust particles for existing facilities are 50 mg/nm3.

10.2.2 SULPHUR OXIDES EMISSION

The new Unit will use lignite from the Premogovnik Velenje coal mine and a desulphurisation plant, which will allow operation in accordance with regulations for such large combustion plants. The emission concentrations will remain under 100 mg SO_2/nm^3. SO_2 emission from the new Unit will reach up to 235 kg/h or 1,562 t/year. Currently allowed emission concentrations for sulphur oxides for existing facilities are 400 mg/nm.

10.2.3 NITROGEN OXIDES EMISSION

The new Unit will use technology which will ensure emission concentrations below 400 mg NO_X/nm^3 upon exit from the boiler. A DeNOx system machine will be placed between the boiler and the air heater, which will reduce emissions under the regulated 150 mg/nm^3. With these concentrations, the nitrogen oxides emission will be up to 352 kg/h or 2,341 t/year. Currently allowed emission concentrations for nitrogen oxides for existing facilities are 500 mg/nm3.

10.2.4 CARBON MONOXIDE EMISSION

Reaching limit values of CO emissions is not problematic in PCC boiler plants. The threshold CO emission concentration of 250 mg/nm^3 will not be exceeded in the new Unit. CO emissions will be up to 170 kg/h or under 1,150 t/year.

10.2.5 GASEOUS INORGANIC SUBSTANCES EMISSION

For boiler plants with thermal power above 300 MW, emissions of chloride, fluoride and ammonia are limited by regulations. The prescribed emission concentration limits for ammonia are in line with the Environmental permit for Unit 6 of 16 June, OGRS 46/02 and 84/02, LCPD 2001/80/EC, as follows:

- for NH_3: 30 mg/nm^3 (dry, O_2 = 6 %)

10.2.6 CARBON DIOXIDE EMISSION

In relation to the current state of emissions from the existing Units of ŠTPP, carbon dioxide (CO_2) emissions will remain on the same level when Unit 6 becomes operational, as the quantity of coal spent will not increase, while the relative emission of CO_2, expressed as kgCO_2/kWh, will decrease.

From the current value of above 1.20 kg CO_2/kWh, the specific emission will drop below 0.9 kg CO_2/kWh after Unit 6 is built, which is a 35 % decrease.

The total CO_2 emission on Unit 6, taking into account the predicted usage of guaranteed coal, CO_2 released from the desulphurisation plant and ELKO use for startups, will be 3,150,459.8 tons per year with 6,650 operating hours (calculated on a full load). Specific emission will be under 0.9 kg CO2/kWh of supplied electricity.

The programme took into account the purchase of CO_2 emission quotas in accordance with the provisions of environmental legislation in the EU and Slovenia. In accordance with the valid legislation and draft National energy program, CO_2 emissions for production of heat will be partially free. Additionally, a sensitivity analysis on the cost price of electricity in case of different prices of CO2 allowances was conducted.

10.3 WATER PROTECTION

10.3.1 WASTE WATER

The new Unit's operation will be associated with the generation of a certain quantity of waste water. The main sources of waste waters are:

Waste water from cooling water purification:

- Water from washing rotary sieves,
- Decarbonisation sludge,
- Water from washing cooling water purification filters.

Waste water from the Unit's production process:

- Water from the condensate cleaning filters regeneration,
- Water from the slag remover,
- Water from product (slag, ash) processing,
- Bilge water.

Waste water from the flue gas desulphurisation process:

- Vacuum filter filtrate.

Waste water (occasional) from washing and cleaning:

- Washing equipment during overhaul or major repair,
- Floor washing,
- Rinsing the electrostatic precipitator,
- Cleaning the reactor and sand filters.

All sources of permanent waste water are captured into closed circuits and redirected back to the technological process, either without purification or after treatment. Therefore, Unit 6 does not produce waste water which would return back into the Paka river. The only exception is the cooling system bilge, but this water is not polluted and can be released into the watercourse without reservations.

Occasional waste water will be collected in a retention basin and pumped either into the waste water purification system (if their pollution allows it) or into the closed circuit of water for dampening the ash depot (against dust release into the ambient air). Waste water generated in the process of cooling water purification will be directed into the waste water treatment sedimentation tank and returned into the cooling water preparation reactor after purification.

Waste water generated in the condensate purification process (regeneration and rinsing of condensate purification filters) is diverted into the neutralisation basin, where acidic and alkaline waste waters mix. The required pH value for reusing this water in the flue gas desulphurisation process can be achieved by adding NaOH or HCl.

Water from product (slag, ash) processing will be returned to the slag remover. Waste water from the slag remover and dirty water from various regular drains and washes will be discharged into the waste water purification plant.

Waste water treatment includes a waste water collection system with retention tanks and elimination of suspended substances in the sedimentation tank and in the filter press. The sludge generated will be taken over by an authorized transferee, while the purified water will be entirely returned into the cooling water preparation process.

The entire vacuum filter filtrate is returned into the desulphurisation plant.

10.3.2 MEASURES FOR THE PROTECTION OF WATERCOURSES AND GROUNDWATER

The new thermal power unit is designed in such a manner that liquids only flow in closed systems during operation and there are no uncontrolled discharges in the boiler room, turbine part or the desulphurisation plant. During overhaul, cleaning and washing waste water is discharged into the retention tank and further on into the waste water treatment process.

At different points of the technological process the following potential water pollutants may appear:

- Turbine oil
- Transformer oil
- Regulation liquid
- Acids and alkalis
- Desulphurisation process suspension

Suspension which may appear in the desulphurisation plant during overhaul or due to potential leaks will be collected in collection channels, which will lead into individual drainage pits. A special emptying tank with a 5000 m^3 capacity is planned within the desulphurisation plant facilities for emptying the flue gas scrubber and other process vessels. All collected liquids are guaranteed to be returned into the process.

All oil-filled electrical transformers and other aggregates containing significant amounts of oil will be equipped with sealing funnels with an outlet into impermeable oil pits. In areas where there is a danger of polluting rainwater or other water with oil or grease, all discharges into the sewage will be routed through oil separators.

Chemical loading facilities will be built in accordance with applicable regulations and equipped with collection basins in case of spills. All channels on the dangerous substances plateau will be water-tight.

Rainwater will be directed into the sewage system, while faecal water will be directed into the central treatment plant.

10.4 WASTE PRODUCTS

10.4.1 ASH, SLAG AND GYPSUM

Waste product from a conventional pulverized coal combustion boiler occurs in the form of ash, which is solid combustion waste and leaves the furnace as slag and as fly ash in flue gas. The slag, which first needs to be cooled with water, is routed from under the furnace with transport conveyors into the slag silo and is used for mixing into the stabilizer once there. Fly ash is extracted from the flue gases in electrostatic precipitators. It needs to be transported into the ash silo from under the electrostatic precipitators. From the silo, it will be sold to consumers or mixed into the stabilizer.

A pulverized coal combustion boiler requires flue gas treatment in a flue gas desulphurisation plant. A wet limestone process, where gypsum is formed in the bonding process of sulphur oxides, is planned for the plant. The gypsum can be either dried and sold or processed into a stabiliser together with fly ash and slag. The desulphurisation process will be conducted so as to achieve a final product where the content of calcium sulphite ($CaSO_3$ x ½ H_2O) does not exceed 0.7-1 % in dry matter.

Ash, slag and gypsum will be processed into a stabilizer, the same as in existing Units 4 and 5, which will be used for mine subsidence control in accordance with the Slovenian technical approval.

Based on average coal, the product quantities will be as follows:

- Fly ash and slag (dry) up to 75 t/h or 498,750 t/year
- Gypsum (dry) up to 34 t/h or 226,100 t/year

With 6,650 operational hours the total annual quantity of dry products will be 724,850 t (or 865,000 t taking into account added hydration water, 638,500 t of which is for disposal). A part of the products will be sold to clients, while the rest will be used for mine subsidence control in the form of a stabilizer.

Typical gypsum composition after the wet limestone process (% in dry matter):

Product	*Unit*	*Normal value*
$CaSO_4$ x H_2O	%	91 – 96
$CaSO_4$ X ½ H_2O	%	0.7 – 1.0
Fly ash	%	0.1 – 2
Calcite ($CaCO_3$)	%	Max. 5
Silicates, siderite, magnesite, fluoride, hematite, clay	%	Max. 5

The new Unit's desulphurisation plant's design will allow part of the product suspension to be drained on a band filter with the intention of acquiring a certain amount of gypsum in useable form. The rest of the product suspension is planned to be mixed with ash and slag into a stabilizer.

According to current experience we can predict the sale of approximately 85,000 tons of fly ash per year, while gypsum sales could be guaranteed in amounts up to 125,000 t/year.

10.4.2 EXPECTED QUALITY OF DISCARDED WATER

The possibility of surface and ground water pollution is one of the most significant impacts that deposited material can have on the environment. The potential impact on surface and ground water can be greatly reduced with appropriate methods of depositing.

The landfill area will have a separate system for the discharge of leachate and water, which will be collected in active landfill areas.

A separate duct system will prevent the invasion of surface water into the landfill site as much as possible.

To supervise the depositing and prevent excessive impact on the environment, monitoring will be implemented at the landfill, which means:
- Constant monitoring of solid particle content in the atmosphere, radioactivity, meteorological conditions;
- Geodetic observation of the landfill;
- Water quality monitoring.

10.4.3 RADIOACTIVITY

As is the case with fly ash always being the source of trace metals in leachate, potential radioactivity problems at a landfill are always directly dependent on ash and coal properties. We consider the radioactivity measurements and analyses of the existing landfill a sound basis for the evaluation of environment impacts.

In the Šoštanj TPP, radioactivity measurements were performed at the ash landfill. The measurements included:

- Determination of the content of radioactive matter in the ash samples,
- Determination of the content of radioactive material taken at the landfill,
- Dose rate measurements at the landfill,
- Determination of the level of radon in the air.

Based on the results of the measurements of radioactive isotope content (U-238, Ra-226, Pb-210, Ra-228, Th-228) in ash samples, it was concluded that the activity of the analysed ash samples does not exceed prescribed values.

Normal concentration of radon (Rn-222) outdoors in the daytime is 5 Bq/m^3. All measured concentrations of radon at the landfill, except for the concentration of radon in the captured emission from a crack at the landfill, were within the normal concentration for indoor spaces. Average annual effective equivalent dose due to radon inhalation in closed spaces is ca. 0.9 mSv/h. Actual dose due to inhalation of radon Rn-222 and its progeny at the ash landfill is several times lower than when staying in a confined space. It does however happen that radon leaking from ash is substantially higher in some parts of the landfill (cracks) than the leaking from the ground in the landfill surroundings.

Based on the results of the radioactivity measurements at the landfill, we can conclude that coal combustion creates ash, which – when deposited at a landfill – presents no particular danger to the environment.

10.5 PROTECTION AGAINST NOISE

Ambient noise measurements are performed regularly in the Šoštanj Thermal Power Plant. The measurements are performed in accordance with the Decree on noise in the natural and living environment (OG RS 45/95) and the Rules on initial measurements and operational monitoring of noise sources and on conditions for their implementation (OG RS 70/96, 45/02). The environmental burden assessment shows that the thermal power plant causes excessive daytime and night time noise pollution in the closest noise-sensitive structures and that some already planned protective measures will need to be implemented.

The planned new Unit is located at the edge of a populated area; therefore, we estimate that the thermal plant belongs to area IV of natural and living environment, and bordering area III. The Decree on noise in the natural and living environment (OG RS 66/96) determines that the threshold noise level for area III (night time level Ln and daytime level Ld) may not exceed 45 dBA. Anti-noise protection of planned structures and equipment will be implemented accordingly.

The anti-noise protection of the new Unit will be implemented on two levels. The first level requires anti-noise protection of the noise sources themselves. Loud aggregates will be enclosed in protective housing or installed into suitable noise reducing chambers and, if necessary, fitted with silencers. Reducing noise levels at the source is also important from the standpoint of providing adequate workplace conditions.

The second level of noise dampening is installing a large part of the equipment into closed structures. The planned facade is made of double corrugated sheet metal and insulation for efficient noise and heat insulation. Insulated smoke channels will be routed into the desulphurisation plant and then the cooling tower. Special care will be given to anti-noise execution of the smokestack.

10.6 EFFECT ON LANDSCAPE APPEARANCE AND ON CULTURAL, HISTORICAL AND NATURAL SITES OF SPECIAL INTEREST

The construction of the new Unit is an important intervention into the landscape area of Šaleška valley. The landscape appearance of the valley is already affected by the existing structures of Šoštanj TPP. Coal mine structures are also located close to the thermal power plant. All these structures are located in a flat area by the Paka river, between the main railway line Celje – Velenje and a hilly area. Electricity production related structures are the most common type of structures in this part of the valley, which is why we can characterize this area as industrial. The construction of a new thermal power structure does not represent a significant change in the quality and appearance of the area.

The new Unit will stand on a plateau between the existing ŠTPP 1 unit and the western border of the ŠTPP industrial zone. The new structures will be of a contemporary design with facades made of high-quality micro-lined sheet metal, while some will be partially or entirely made of reinforced concrete. It will be possible to improve the impression of the size of the structures and their connection to the background with suitable colour choices. Since the background is hilly, the height of the new structures will not be particularly disruptive. The planning of this kind of structures is normally subjected to technological requirements which dictate specific technological solutions and interventions into the landscape. The architectural design of the planned structures will facilitate their inclusion into the industrial character of the complex.

11 TIME SCHEDULE OF CONSTRUCTION

The complete time schedule of construction is provided in Annex 1.

Major dates include:

- Selecting the supplier for the MTE and signing the reservation contract September 2007
- Signing the MTE contract June 2008
- Signing the FGD contract June 2009
- Signing the NTP for the MTE December 2009
- Building permit for the MTE March 2011
- End of preliminary running November 2014

Despite the fact that the original date of obtaining a building permit for the MTE was in October 2010 and construction permit was granted in March 2011, it is still possible with optimization of working processes to reach the target that experimental running of the facility finishes in November 2014.

12 ESTIMATED VALUE OF THE INVESTMENT AND SOURCES OF FUNDING

12.1 ESTIMATED VALUE OF THE INVESTMENT

The estimated value of the investment is based on:

a) Value of the main technological equipment according to the contract with Alstom.
b) Value of the FGD equipment according to the contract with the Rudis-Esotech-Engineering-Dobersek consortium.
c) Value of the Cooling system equipment according to the contract with the Rudis-SPX consortium.
d) Value of the contract concluded with Primorje for construction work on the main power facility (MPF).
e) Value of the construction work and of other equipment with installation, based on the investment programme and corrected according to the information about changes of equipment parts and construction worksprices.
f) Financing costs during the construction phase, based on amended positions on the structure and dynamics of financing. The financing costs during construction include intercalary interest, credit approval costs, warranty approval costs and credit insurance costs.
g) The values do not include VAT.
h) Decommissioning costs are included in the project costs.

To calculate the estimated value at current prices, the following has been taken into account:
- The investor's estimate of the predicted annual inflation rate in the amount of 3.0 % for 2011, and 2.0 % for following years.
- Construction dynamics.
- Constant prices are calculated based on the status on 28 February 2011.

The investor will levy and pay value added tax in several different ways – with self-taxation and payment of VAT to the supplier. Due to temporal discrepancies between payment and reimbursement of VAT, the tax will need to be financed with own resources from current operations and with short-term loans. For the purpose of bridging the liquidity of VAT, the company has secured a line of credit in the amount of 12.5 million EUR at a commercial bank.

Table 12.1: Estimated value of the investment

	Constant prices	***Current prices***	***Change***
	000 EUR	***000 EUR***	***%***
Construction work	**74,868.2**	75,969.3	1.5 %
Preparatory work	20,485.7	20,569.7	0.4 %
MPF	34,663.3	35,342.0	2.0 %
Other structures	10,680.7	11,000.0	3.0 %
Administration building	8,507.6	8,507.6	0.0 %
Other	530.9	550.0	3.6 %
Equipment	**964,273.6**	1,063,120.7	10.3 %
MTE	699,156.3	699,434.0	0.0 %
MTE escalation	9,372.6	100,056.5	967.5 %
MTE installation	97,205.9	100,000.0	2.9 %
Reservation contract	25,000.0	25,000.0	0.0 %
FGD	78,553.0	82,053.0	4.5 %
Water treatment	7,515.9	7,700.0	2.4 %
Coal transport	4,986.9	5,100.0	2.3 %
Product processing	13,000.1	13,500.0	3.8 %

Cooling system	23,338.1	24,047.2	3.0 %
Technological links	1,989.4	2,000.0	0.5 %
Connection to the electricity system of RS	3,446.7	3,500.0	1.5 %
Other	708.8	730.0	3.0 %
Other	**34,107.5**	35,106.9	2.9 %
Investor expenses	27,563.2	28,337.8	2.8 %
Insurance	6,544.3	6,769.1	3.4 %
Total	**1,073,249.4**	1,174,196.9	9.4 %
Financing expenses	122,678.7	128,550.2	4.8 %
TOTAL	**1,195,928.1**	1,302,747.0	8.9 %

Of that:

HSE guarantee expenses	6,166.6	6,540.8	6.1 %

Estimated value EUR/kW[9]	**1,788.7**
Of that:	
Preparatory work	34.1
Equipment with installation and construction work	1,731.9
Investor expenses	42.2

[9] So-called »Over Night Costs«, which are used for comparing investments, and financing expenses and the impact of inflation are therefore not taken into account.

Table 12.2: Construction dynamics, constant price, in 000 EUR

	Already paid	*2011*	*2012*	*2013*	*2014*	*2015*	*TOTAL*
Construction work	**14,912.4**	**29,563.2**	**21,444.9**	**8,502.6**	**445.0**	**0.0**	**74,868.2**
Preparation work	6,404.8	14,080.9	0.0	0.0	0.0	0.0	20,485.7
MPF	0.0	12,980.7	17,268.7	4,413.9	0.0	0.0	34,663.3
Other structures	0.0	2,387.2	4,026.4	3,942.1	325.0	0.0	10,680.7
Administration building	8,507.6	0.0	0.0	0.0	0.0	0.0	8,507.6
Other	0.0	114.4	149.8	146.7	120.0	0.0	530.9
Equipment	**258,655.4**	**163,568.0**	**294,404.4**	**137,202.4**	**106,076.1**	**4.367.2**	**964,273.6**
MTE	203,927.1	107,930.0	224,692.1	84,885.2	74,941.2	2.780.7	699,156.3
MTE escalation	9,372.6	0.0	0.0	0.0	0.0	0.0	9,372.6
MTE assembly	0	44,651.3	15,360.4	18,787.2	18,406.9	0.0	97,205.9
Reservation contract	25,000.0	0.0	0.0	0.0	0.0	0.0	25,000.0
FGD	17,473.1	0.0	32,523.1	19,037.9	7,932.5	1.586.5	78,553.0
Water treatment	0.0	0.0	7,515.9	0.0	0.0	0.0	7,515.9
Coal transport	0.0	1,122.1	3,318.7	546.0	0.0	0.0	4,986.9
Product processing	0.0	0.0	5,034.6	7,965.5	0.0	0.0	13,000.1
Cooling system	2,882.7	6,206.7	3,762.6	5,748.0	4,738.1	0.0	23,338.1
Technological links	0.0	1,989.4	0.0	0.0	0.0	0.0	1,989.4
Connection to the electricity system of RS	0.0	1,487.2	1,959.6	0.0	0.0	0.0	3,446.7
Other	0.0	181.3	237.5	232.5	57.4	0.0	708.8
Other	**8,590.8**	**6,809.4**	**7,795.3**	**6,107.2**	**4,815.9**	**0.0**	**34,118.6**
Investor expenses	8,590.8	5,123.8	6,141.9	4,488.7	3,229.1	0.0	27,574.3
Insurance	0.0	1,685.6	1,653.4	1,618.6	1,586.8	0.0	6,544.3
Total	**282,158.6**	**199,940.6**	**323,644.7**	**151,812.2**	**111,337.1**	**4.367.2**	**1,073,260.4**
Financing expenses	5,688.4	14,340.8	28,393.5	36,701.0	37,555.0	0.0	122,678.7
TOTAL	**287,847.0**	**214,281.4**	**352,038.2**	**188,513.2**	**148,892.1**	**4.367.2**	**1,195,939.1**

Table 12.3: Construction dynamics, current prices, in 000 EUR

	Already paid	*2011*	*2012*	*2013*	*2014*	*2015*	*TOTAL*
Construction work	**14,912.4**	**26,018.9**	**24,349.5**	**10,216.8**	**471.7**	**0.0**	**75,969.3**
Preparation work	6,404.8	14,164.9	0.0	0.0	0.0	0.0	20,569.7
MPF	0.0	9,332.6	20,071.0	5,938.4	0.0	0.0	35,342.0
Other structures	0.0	2,406.3	4,125.0	4,125.0	343.8	0.0	11,000.0
Administration building	8,507.6	0.0	0.0	0.0	0.0	0.0	8,507.6
Other	0.0	115.1	153.5	153.5	127.9	0.0	550.0
Equipment	**258,655.4**	**204,234.2**	**336,458.7**	**146,826.8**	**112,268.2**	**4,677.4**	**1,063,120.7**
MTE	203,927.1	107,930.0	224,750.5	84,885.2	74,941.2	3,000.0	699,434.00
MTE escalation	9,372.6	40,236.1	39,224.0	7,040.5	4,183.3	0.0	100,056.5
MTE assembly	0	45,000.0	15,714.3	19,642.9	19,642.9	0.0	100,000.0
Reservation contract	25,000.0	0.0	0.0	0.0	0.0	0.0	25,000.0
FGD	17,473.1	0.0	34,386.7	20,128.8	8,387.0	1,677.4	82,053.0
Water treatment	0.0	0.0	7,700.0	0.0	0.0	0.0	7,700.0
Coal transport	0.0	1,133.3	3,400.0	566.7	0.0	0.0	5,100.0
Product processing	0.0	0.0	5,192.3	8,307.7	0.0	0.0	13,500.0
Cooling system	2,882.7	6,252.3	3,847.6	6,011.8	5,052.9	0.0	24,047.2
Technological links	0.0	2,000.0	0.0	0.0	0.0	0.0	2,000.0
Connection to the electricity system of RS	0.0	1,500.0	2,000.0	0.0	0.0	0.0	3,500.0
Other	0.0	182.5	243.3	243.3	60.8	0.0	730.0
Other	**8,590.8**	**7,000.4**	**8,094.7**	**6,354.7**	**5,066.3**	**0.0**	**35,106.9**
Investor expenses	8,590.8	5,308.1	6,402.4	4,662.5	3,374.0	0.0	28,337.8
Insurance	0.0	1,692.3	1,692.3	1,692.3	1,692.3	0.0	6,769.1
Total	**282,158.6**	**237,253.5**	**368,902.8**	**163,398.4**	**117,806.2**	**4,677.4**	**1,174,196.9**
Financing expenses	5,688.4	15,021.8	29,922.0	37,790.5	40,127.5	0.0	128,550.2

TOTAL	**287,847.0**	**252,275.2**	**398,824.8**	**201,188.9**	**157,933.7**	**4,677.4**	**1,302,747.0**

12.2 SOURCES OF FUNDING

The following sources of funding are projected:
- Equity sources – free depreciation, profits, capital injections from HSE
- EIB loan in the amount of 550 million EUR
- EBRD loan in the amount of 200 million EUR
- HSE loan in the amount of 83 million EUR at current prices

Table 12.4: Sources of funding

	Constant Prices		***Current Prices***	
	000 EUR	***%***	***000 EUR***	***%***
1. Equity sources	445,939.1	37.3 %	469,747.0	36.1 %
• ŠTPP	129,807.9	10.9 %	144,819.3	11.1 %
• HSE	316,131.2	26.4 %	324,927.7	24.9 %
2. EIB loan	550,000.0	46.0 %	550,000.0	42.2 %
3. EBRD loan	200,000.0	16.7 %	200,000.0	15.4 %
4. HSE Group loan	0.0	0.0 %	83,000.0	6.4 %
Total	1,195,939.1	100.0 %	1,302,747.0	100.0 %

Due to known facts about the amount of the EIB and EBRD loans, the values of both loans are given in the same amount at constant as well as current prices. The difference in the value of the investment between both methodological approaches (constant prices – current prices) is therefore guaranteed by the HSE Group loans, which will also be the situation in reality.

Table 12.5: Sources of funding and investment dynamics, constant prices, in 000 EUR

	Already paid	*2011*	*2012*	*2013*	*2014*	*2015*	*TOTAL*	*%*
1. Equity funds	**137,847.0**	**18,281.4**	**29,038.2**	**107,513.2**	**148,892.1**	**4,367.2**	**445,939.1**	**37.3 %**
- ŠTPP	15,730.2	16,784.7	29,038.2	29,660.2	34,227.4	4,367.2	129,807.9	10.9 %
- HSE	122,116.8	1,496.7	0.0	77,853.0	114,664.7		316,131.2	26.4 %
2. EIB loan	**110,000.0**	**22,000.0**	**363,000.0**	**55,000.0**	**0.0**	**0.0**	**550,000.0**	**46.0 %**
3. EBRD loan	**0.0**	**174,000.0**	**0.0**	**26,000.0**	**0.0**	**0.0**	**200,000.0**	**16.7 %**
4. Short-term HSE Group loans	**40,000.0**	**0.0**	**-40,000.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0 %**
TOTAL	**287,847.0**	**214,281.4**	**352,038.2**	**188,513.2**	**148,892.1**	**4,367.2**	**1,195,939.1**	**100.0 %**

Table 12.6:Sources of funding and investment dynamics, current prices, in 000 EUR

	Already paid	*2011*	*2012*	*2013*	*2014*	*2015*	*TOTAL*	*%*
1. Equity funds	**137,847.0**	**26,275.2**	**50,824.8**	**121,188.9**	**128,933.7**	**4,677.4**	**469,747.0**	**36.0 %**
- ŠTPP	15,730.2	18,103.3	31,902.4	31,736.8	42,669.3	4,677.4	144,819.3	11.1 %
- HSE	122,116.8	8,171.9	18,922.5	89,452.1	86,264.4		324,927.7	24.9 %
2. EIB loan	**110,000.0**	**34,000.0**	**406,000.0**	**0.0**	**0.0**	**0.0**	**550,000.0**	**42.2 %**
3. EBRD loan	**0.0**	**174,000.0**	**0.0**	**26,000.0**	**0.0**	**0.0**	**200,000.0**	**15.4 %**
4. Short-term HSE Group loans	**0.0**	**0.0**	**0.0**	**54,000.0**	**29,000.0**	**0.0**	**83,000.0**	**6.4 %**
TOTAL	**40,000.0**	**18,000.0**	**-58,000.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0 %**

12.3 CREDIT OBLIGATION CALCULATION

12.3.1 EIB loan

Amount: **550,000.0 thousand EUR**
Tranche 1 *110,000.0 thousand EUR (drawdown 1. half-year 2011)*
Tranche 2 *34,000.0 thousand EUR (drawdown 2. half-year 2011)*
Tranche 3 *245,000.0 thousand EUR (drawdown 1. half-year 2012)*
Tranche 4 *161,000.0 thousand EUR (drawdown 2. half-year 2012)*

Interest rate:
Tranche 1: 3.0 % until the end of 2020
4.2 % from 2021 until the end
Other tranches: 3.8 % fixed annual

Repayment of any amount drawn is 25 years. The first and second tranche have a 5-year moratorium on repayment of the principal, while other tranches have a 4-year moratorium on repayment of the principal.

Interest during construction (intercalary interest)[10]: semi-annual payment
Regular interest[8]: semi-annual payment
Principal[8]: semi-annual payment

First payment of the principal:
Tranche 1 *1/2016*
Tranche 2 *2/2016*
Tranche 3 *1/2016*
Tranche 4 *2/2016*

Credit insurance (Tranche 1): 100 % commercial bank guarantee
Credit insurance (Tranche 2 – 4): 100 % state guarantee
Credit insurance cost – guarantee (Tranche 1): 1.65 % per annum on the status of the loan until 2015
1.00 % per annum on the status of the loan from 2016 until the end
Credit insurance cost – HSE guarantee (80 % guarantee on Tranche 1):
0.40 % per annum on the status of the loan from 2014
0.60 % per annum on the status of the loan from 2015 until the end
Cost of insurance approval (Tranche 1): 0.95 % of the loan amount, one-time payment upon insurance
Credit insurance cost – guarantee (Tranche 2 – 4): 0.80 % per annum on the status of the loan

12.3.2 EBRD loan

Amount (current prices): **200,000.0 thousand EUR**
Tranche 1 *174,000.0 thousand EUR (1st half-year 2011)*
Tranche 2 *26,000.0 thousand EUR (1st half-year 2013)*

Interest rate: 6.1 % fixed annual

[10] The amortization schedule shows the repayment of interest and the principal cumulatively on an annual level; they are not shown on a semi-annual level in order to ensure transparency.

The loan is divided into two parts. Part A is insured with a HSE guarantee and represents 80 % of the total value of the loan. The repayment period for this part of the loan is 15 years with the first payment of the principal due in 2/2015.

Part B is insured with assignment of long-term ŠTPP receivables to HSE and represents 20 % of the total value of the loan. The repayment period for this part is 12 years with the first repayment of the principal due in 2/2015.

Interest during construction (intercalary interest)[11]:	semi-annual payment
Regular interest[9]:	semi-annual payment
Principal[9]:	semi-annual payment

First payment of the principal:

Tranche 1	*2/2015*
Tranche 2	*2/2015*

Credit insurance:	80 % HSE guarantee 20 % ŠTPP assignment of long-term receivables
Credit insurance cost – HSE guarantee:	0.40 % per annum on the status of the loan from 2014 0.60 % per annum on the status of the loan from 2015 until the end
Commitment fee:	0.90 % per annum for part A and 1.00 % per annum for part B on the status of the unused part of the loan
Cost of insurance approval:	1.30 % of the loan amount, one-time payment upon approval
Syndication cost:	0.25 % of the syndicated amount

12.3.3 HSE Group loan

Amount (current prices):	**83,000.0 thousand EUR**
Tranche 1	*54,000.0 thousand EUR (drawdown 2/2013)*
Tranche 2	*29,000.0 thousand EUR (drawdown 2/ 2014)*

Interest rate: 4.2 % fixed annual

Each tranche has a repayment period of 5 years after Unit 6 becomes operational (2020) with a moratorium on repayment of the principal until 2016.

First payment of the principal:

Tranche 1	*2/2016*
Tranche 2	*2/2016*

Regular interest[9]:	semi-annual payment
Principal[9]:	semi-annual payment

[11] The amortization schedule shows the repayment of interest and the principal cumulatively on an annual level; they are not shown on a semi-annual level in order to ensure transparency.

12.3.4 Calculation of financing costs during construction

Table 12.7/1: Financing costs during construction (constant prices, in 000 EUR)

	Already paid	**2011**	**2012**	**2013**	**2014**	**TOTAL**
EIB A loan drawdown		110,000.0	0.0			110,000.00
Intercalary interest		2,475.0	3,300.0	3,300.0	3,300.0	12,375.0
Granting of guarantee	1,045.0					1,045.0
Cost of insurance		1,361.3	1,815.0	1,815.0	1,815.0	6,806.3
EIB B loan drawdown		22,000.0	363,000.0	55,000.0		440,000.0
Intercalary interest		209.0	8,464.5	16,197.5	16,720.0	41,591.0
Cost of insurance		880.0	3,520.0	3,520.0	3,520.0	11,440.0
Financing costs EIB loan	**1,045.0**	***4,925.3***	***17,099.5***	***24,832.5***	***25,355.0***	***73,257.3***
EBRD loan drawdown		174,000.0	0	26,000.0	0.0	200,000.0
Intercalary interest		7,960.5	10,614.00	11,803.50	12,200.00	42,578.0
Commitment fee		195.0	260.0	65.0	0.0	520.0
Cost of approval	2,600.0		0.0	0.0	0.0	2,600.0
Syndication cost	250.0					250.0
Financing costs EBRD loan	**2,850.0**	***8,155.5***	***10,874.0***	***11,868.5***	***12,200.0***	***45,948.0***
HSE Group loan drawdown		40,000.0	-40,000.0	0.0	0.0	0
Intercalary interest		1,260.0	420.0	0.0	0.0	1,680.0
Financing costs HSE Group loan	**0.0**	***1,260.0***	***420.0***	***0.0***	***0.0***	***1,680.0***
Other financing costs	**1,793.4**					**1,793.4**
TOTAL FINANCING COSTS	**5,688.4**	**14,340.8**	**28,393.5**	**36,701.0**	**37,555.0**	**122,678.7**

Other financing costs are primarily: costs of short-term bridge loans, costs of the EBRD mandate letter, due diligence costs and other costs associated with the coordination necessary for signing contracts.

Table 12.7/2:Financing costs during construction (current prices, in 000 EUR)

	Already paid	**2011**	**2012**	**2013**	**2014**	**TOTAL**
EIB A loan drawdown		110,000.0	0.0	0.0		110,000.00
Intercalary interest		2,475.0	3,300.0	3,300.0	3,300.0	12,375.0
Granting of guarantee	1,045.0					1,045.0
Cost of insurance		1,361.3	1,815.0	1,815.0	1,815.0	6,806.3
EIB B loan drawdown		34,000.0	406,000.0			440,000.0
Intercalary interest		323.0	9,804.0	16,720.0	16,720.0	43,567.0
Cost of insurance		880.0	3,520.0	3,520.0	3,520.0	11,440.0
Financing costs EIB loan	**1,045.0**	***5,039.3***	***18,439.0***	***23,355.0***	***25,355.0***	**75,233.3**
EBRD loan drawdown		174,000.0	0.0	26,000.0	0.0	200,000.0
Intercalary interest		7,960.5	10,614.00	11,803.50	12,200.0	42,578.0
Commitment fee		195.0	260.0	65.0	0.0	520.0
Cost of approval	2,600.0	0.0	0.0	0.0	0.0	2,600.0
Syndication cost	250.0					250.0
Financing costs EBRD loan	**2,850.0**	***8,155.5***	***10,874.0***	***11,868.5***	***12,200.0***	***45,948.0***
HSE Group loan drawdown		58,000.0	-58,000.0	54,000.0	29,000.0	83,000.0
Intercalary interest		1,827.0	609.0	567.0	2,572.5	5,575.5
Financing costs HSE Group loan	**0.0**	***1,827.0***	***609.0***	***567.0***	***2,572.5***	***5,575.5***
Other financing costs	**1,793.4**					**1,793.4**
TOTAL FINANCING COSTS	**5,688.4**	**15,021.8**	**29,922.0**	**37,790.5**	**40,127.5**	**128,550.2**

Other financing costs are primarily: costs of short-term bridge loans, costs of the EBRD mandate letter, due diligence costs and other costs associated with the coordination necessary for signing contracts.

13. COST PRICE OF ELECTRICITY PRODUCED AND INVESTMENT ELIGIBILITY CALCULATION[12]

13.1 INPUT DATA

1.	Generator power	600 MW
2.	Own consumption	54.5 MW
3.	Theoretical threshold power	545.5 MW
4.	Threshold power	542.5 MW (0.5 % aging factor considered)
5.	Specific threshold consumption	8,451 kJ/kWh
6.	Calorific value of coal	10.47 MJ/kg
7.	Coal price	2.25 EUR/GJ
8.	Hours of operation at full power	6,650 h/year
9.	Coal consumption	
	For power and heat production	440.3 t/h
10.	Limestone consumption	21.01 t/h
11.	Limestone price	25.5 EUR/t
12.	Ammonia consumption	0.56 t/h
13.	Ammonia price	155.0 EUR/t
14.	DEMI water consumption	38.0 m^3/h
15.	DEMI water price	1.40 EUR/m^3
16.	DECA water consumption	1,055 m^3/h
17.	DECA water price	0.1 EUR/m^3
18.	Fuel oil consumption for startup	600 t/year
19.	Fuel oil price	700 EUR/t
20.	Product quantity	total 130.3 t/h, for disposal 98.2 t/h
	- Sale of ash	13.1 t/h at 7.0 EUR/t
	- Sale of gypsum	19.0 t/h at 12.0 EUR/t
21.	Price of disposal	2.0 EUR/t
22.	Number of employees	200
23.	Labour cost	35,500 EUR/employee/year
24.	Other expenses	5.5 million EUR/year
25.	Maintenance	3.3 million EUR (1st, 2nd, 3rd year)
		6.6 million EUR (4th to 25th year)
		8.25 million EUR (26th to 40th year)

Maintenance costs are provided based on factors for maintenance of such facilities, accounting for experience and regular maintenance and overhaul data for Unit 5 of ŠTPP. The given figures are an average of regular maintenance and overhauling every 4 years, based on 6,650 annual operational hours at full power. The maintenance costs are projected based on full power operational hours (6,650 h calculated to full power). However, since the supply of coal will begin to decrease after 2030, the number of operational hours of Unit 6 will also decrease. Thus, based on experience with maintenance of the existing units, the maintenance costs have been calculated on the principle of 1/3 fixed maintenance costs and 2/3 maintenance costs due to wear, which is smaller due to fewer operational hours.

26.	Service life	40 years
27.	Depreciation	construction work 2.5 % annually, equipment and miscellaneous 3.33 % annually
28.	CO_2 emission	1.056 kg CO_2/kg of coal
CO_2 emission with 6,650 op. h.		3,150,459.8 t/year or 473.8 t/h
	- Coal	3,091,908 t/year
	- Desulphurisation	57,190 t/year

[12] The projected prices are opening constant prices for 2015.

- Fuel oil for startup 1,362 t/year

29. Price of emission credits 22.3 EUR/t CO_2

13.2 COST PRICE OF ELECTRICITY AT THE THRESHOLD OF ŠTPP

Table 13.1 shows the costs of production and the production of electricity for certain years. The calculation for all years is given in Annex 2.

Table 13.1: Production costs and electricity production

in 000 EUR

	2015	*2020*	*2025*	*2035*	*2045*	*2054*
1. Coal	68,982.3	70,724.2	72,510.1	65,078.3	54,725.2	57,237.6
2. Limestone	3,563.1	3,653.1	3,745.3	3,361.5	2,826.7	2,956.5
3. Ammonia	577.2	591.8	606.7	544.6	457.9	478.9
4. DEMI water	353.8	353.8	353.8	302.1	241.7	241.7
5. Technological water	701.6	701.6	701.6	599.0	479.2	479.2
6. ELKO	420.0	441.4	463.9	512.5	566.1	619.1
7. Product disposal costs	1,306.4	1,306.4	1,306.4	1,115.5	892.4	892.4
8. Maintenance	3,300.0	6,600.0	6,600.0	5,956.9	6,506.9	6,506.9
9. Other expenses	5,500.0	5,638.9	5,781.3	6,330.1	6,387.7	6,681.0
10. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	2,107.2	2,107.2
11. Labour costs	7,100.0	7,462.2	7,842.8	9,024.3	9,569.7	10,466.3
12. Financing costs	41,600.8	27,576.8	16,487.5	2,485.3		
13. CO_2 emission credits	68,823.8	78,070.6	90,806.4	111,575.4	128,160.5	177,476.3
14. Heat generation costs	-5,639.2	-6,205.8	-6,829.4	-10,143.5	-12,284.4	-14,595.0
TOTAL all expenses	**244,951.5**	**245,843.3**	**249,928.4**	**249,608.0**	**212,921.1**	**266,143.0**
TOTAL electricity expenses	**239,312.3**	**239,637.4**	**243,098.9**	**239,464.5**	**200,636.7**	**251,548.0**
Production (GWh)	3,529.3	3,529.3	3,529.3	2,998.3	2,398.7	2,398.7

The projected production of Unit 6 is calculated based on the predicted 6,650 hours of operation a year and at the same time it is also connected with the available quantity (planned mining) of coal.

13.3 CALCULATION OF REVENUE AND EXPENSES

The project’s revenue consists of electric and thermal power sale profits and ash and gypsum sale profits. Electric power sales profits are calculated based on the prices from the National Energy Programme draft. Revenue from the sales of thermal power is calculated based on an opening price of 16 EUR/MWh. Revenue from the sales of ash and gypsum is calculated based on an opening price of 7 EUR/t for ash and 12 EUR/t for gypsum. The expenses include all expenses calculated and presented in the previous section. All input data on prices of other energy products are consistent with HSE and ŠTPP professional services.
Table 13.2 shows the revenue and expenses for certain years. The calculation for all years is given in Annex 3.

Table 13.2: Revenue and expenses of the project (000 EUR)

	2015	*2020*	*2025*	*2035*	*2045*	*2054*
REVENUE	**271,707.5**	**291,510.7**	**324,302.3**	**331,484.6**	**324,811.1**	**385,396.2**
1.Electrical and thermal power sales	266,207.5	285,655.9	318,067.3	324,403.8	316,755.4	376,334.2
2. Ash and gypsum sales	1,500.0	1,650.7	1,816.6	2,200.0	2,664.3	3,165.5

3. Ancillary services	4,000.0	4,204.0	4,418.5	4,880.8	5,391.4	5,896.5
EXPENSES	**244,951.5**	**245,843.3**	**249,928.4**	**249,608.0**	**212,921.1**	**266,143.0**
1. Coal	68,982.3	70,724.2	72,510.1	65,078.3	54,725.2	57,237.6
2. Maintenance	3,300.0	6,600.0	6,600.0	5,956.9	6,506.9	6,506.9
3. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	2,107.2	2,107.2
4. Labour costs	7,100.0	7,462.2	7,842.8	9,024.3	9,569.7	10,466.3
5. Financing costs	41,600.8	27,576.8	16,487.5	2,485.3		
6. Other costs	12,422.1	12,686.9	12,959.0	12,765.2	11,851.7	12,348.8
7. CO_2 emission credits	68,823.8	78,070.6	90,806.4	111,575.4	128,160.5	177,476.3
PROFIT/LOSS	**26,756.0**	**45,667.4**	**74,374.0**	**81,876.6**	**111,890.0**	**119,253.2**
Income tax	5,351.2	9,133.5	14,874.8	16,375.3	22,378.0	23,850.6
NET PROFIT/LOSS	**21,404.8**	**36,533.9**	**59,499.2**	**65,501.3**	**89,512.0**	**95,402.6**

The project generates revenue which is higher than the expenses in all years of operation, which allows for repayment of the principal of loans.

13.3.1 FINANCIAL EFFECTS OF DECOMISSIONING EXISTING PRODUCTION UNITS AND UNIT 6

	Demolition and removal costs	Units 1-3	Unit 4	Unit 5	Unit 6	Gas units	Total
1	Preparation of documentation	16.5	29.5	36.2	72.3	5.0	159.5
2	Demolition works	400.0	700.0	852.0	2,556.0	100.0	4,608.0
3	Disassembly and removal	10.0	16.4	20.0	60.0	10.0	116.4
4	Processing and disposal of construction waste	85.0	170.0	213.0	639.0	25.0	1,132.0
5	Environment impact monitoring	13.2	23.6	28.9	86.8	5.0	157.6
	Total costs:	**524.7**	**939.6**	**1,150.1**	**3,414.1**	**145.0**	**6,173.5**

	Revenue from sales	Units 1-3	Unit 4	Unit 5	Unit 6	Gas units	Total
1	Construction steel	600.0	984.0	1,200.0	3,600.0	100.0	6,484.0
2	Copper	432.0	860.0	1,012.0	2,024.0	60.0	4,388.0
	Total revenue:	**1,032.0**	**1,844.0**	**2,212.0**	**5,624.0**	**160.0**	**10,872.0**

Difference	**4,698.5**

Decommissioning thermal power plants is a specific case, incomparable to decommissioning other types of power plants, for example nuclear power plants. The materials that thermal power plants are constructed of are still useful after the end of the plant's service life and can still be used on the market. Due to this characteristic, decommissioning a thermal power plant does not represent a cost – as it is normally the case with nuclear power plants – but the effect of decommissioning can even be positive. As we can see in the table above, which only includes the two key items (construction steel and copper), the quantity of construction steel and copper which can be reused is very high and the revenue from decommissioning all production units of ŠTPP exceeds 10 million EUR. On the other hand, decommissioning expenses are substantially lower and amount to ca. 6 million EUR. The table above shows that the net effect of decommissioning ŠTPP production units is positive and that ŠTPP generates positive cash flow of over 4 million EUR from decommissioning.

13.4 PROJECT LIQUIDITY

To demonstrate the project's liquidity in the construction stage as well as in the regular operation stage, a financial flow for the project is given in Annex 4. Net inflow from the financial flow is positive during the entire project. Thus, the project is liquid through its entire duration.

Inflow of the project:

- Sales revenue
- Investment financing resources (equity sources and credit resources)

Outflow of the project:

- Investment expenses
- Operational expenses (without depreciation)
- Commitment to funding sources (principal, interest and other financing expenses)
- Income taxes

The difference between inflow and outflow is net inflow.

13.5 FINANCIAL AND MARKET PERFORMANCE

When calculating the effects of the investment, we assumed that the electricity and CO_2 emission credits price scenario as projected in the NEP draft will occur. Because the NEP draft only predicts the prices of electricity and CO_2 emission credits until 2030, the same change as the average change in the entire period that the NEP draft predicts prices for was used for both items for the period 2030–2054. In addition to accounting for changes of both items predicted in the NEP draft, we have also increased the expenses of all items that ŠTPP will have during the project (coal costs, labour costs, additive costs etc.) by appropriate indices.

Financial and market effects:

The financial and market effects have been prepared in accordance with the Decree on the uniform methodology for the preparation and treatment of investment documentation in the field of public finance (http://www.uradnilist.si/1/objava.jsp?urlid=200660&stevilka=2549), which imposes a 7 % discount factor for investments financed in accordance with this decree.

Investment repayment period	15 years
NPV with a 7 % discount rate	83.6 million EUR
IRR	7.59 %
RNPV	0.108
Relative benefit indicator	1.027
Return on equity (ROE)	13.6 %

An economic flow of the project, including the period of implementing the project as well as the 40-year service life (economic life of the project), has been prepared to calculate the project's financial and market performance. Economic inflow consists of revenue from the sales of electric and thermal power, revenue from ash and gypsum sales, and income from ancillary services, while the economic outflow consists of the investment value (excluding financing costs), operating costs (excluding depreciation and financing costs) and income taxes generated by the project. A discount rate of 7 % has been used. The following economic markers have been calculated:

a) Investment Repayment Period: 15 years

The investment repayment period is the time (period expressed by a number of years) in which the generated liquid assets cover the investment costs. This is achieved when the economic flow of the investment becomes cumulatively positive. The economic life of a project must therefore be longer than the investment repayment period, or a correct result cannot be deduced from the economic flow. Considering the fact that the economic life of the project is 40 years, the investment repayment period indicator is strongly positive.

b) Net Present Value (Discount Factor – 7 %): 83.6 million EUR

This method requires that we discount investment expenditure and return on an initial term (t0) when the first investment expenditure occurs. By discounting the expenditure and return, we include the appropriate time component, making the amounts of return and investment expenditure in various units of time comparable. After that, we deduct investment expenditure from the sum of the discounted return.

$NPV=S\ R_t/(1+r)^t-S\ I_t/(1+r)^t$

NPV=net present value

R_t=return in period t

I_t=investment expenditure in period t

t=period (month, year …) 1, 2, 3 … n

r=discount rate

The discount rate expresses the required rate of return. A positive net present value shows that the return is greater than the investment expenditure. A negative net present value shows that the sum of the return with the discount rate used (required rate of return) is not high enough to compensate for the investment expenditure.

When assessing a single investment, the investment is viable if the net present value is greater than 0. When assessing several investments, we choose the investment with the highest net present value, provided that it is greater than 0.

The problem which appears when using the net present value method is choosing the appropriate discount rate, as the value of the discount rate has a significant impact on the value of the NPV. If we use the same return and investment expenditure values, the NPV will be higher if we use a lower discount rate, and lower if we use a higher discount rate. *Draga Stepko* says that "according to the western theory – the discount rate reflects subjective temporal preferences between the current and future expenditure and the investor's assessment of future returns in the present. But investors practically don't know discount rates; in fact they don't even try to know them." She therefore suggests that either the interest rate at which the investor can obtain a loan to finance the investment (if the investment is financed by external sources) or the return it could achieve if the funds would be placed in a financial investment (if the investment is financed by own sources) is used as the discount rate.

According to another theory, "companies use the weighted average of the cost of capital as the required rate of return". Consequentially, as the net return on equity is already reduced by the financing costs, the interest and cost of capital should not be included in the net financial flow from which the NPV is calculated.
The risk of the investment should also be taken into account. The average return on equity is structured as the return on various investment projects in the past, each with its own degree of risk.

Given that the costs of debt financing sources are more or less known; we can determine the expected return on equity based on the discount factor used.

$WACC=S_{EBRD}*C_{EBRD} + S_{EIBA}*C_{EIBA} + S_{EIBB}*C_{EIBB} + S_{LHSE}*C_{LHSE} + S_{EF}*C_{EF}$

S_{EBRD} – share of the EBRD loan in the total value of the investment

C_{EBRD} – cost of the EBRD loan

S_{EIBA} – share of the EIB A loan in the total value of the investment

C_{EIBA} – cost of the EIB A loan

S_{EIBB} – share of the EIB B loan in the total value of the investment

C_{EIBB} – cost of the EIB B loan

S_{LHSE} – share of the HSE loan in the total value of the investment

C_{LHSE} – cost of the HSE loan

S_{EF} – share of equity funds in the total value of the investment

C_{EF} – cost of equity funds

With an expected 7 % weighted average cost of capital (discount factor), the cost/return on equity in the price scenario from the NEP draft is higher than 13 %, which is a relatively very high return on equity and exceeds the return of comparable projects. The RS sectoral policy for energy sector projects, which is currently being prepared, will likely require a 9 % return on equity. If we use this required rate of return, the cost of capital – and consequentially the discount rate – would be around 6 %.

c) Internal Rate of Return: 7.59 %

The internal rate of return is the discount rate where the net present value equals 0. This can be expressed mathematically with the following formula:

Σ Dt/(1+r)t = Σ It/(1+r)t

When the formula is valid, the r represents the internal rate of return. The internal rate of return also tells us the amount of the interest rates that the investor can pay for the loan without incurring a loss in the event that the entire investment is financed by a loan.

The internal rate of return is used so as to compare it with the required rate of return. The internal rate of return must always be higher than the required rate of return.

d) Relative Net Present Value: 0.108

The relative NPV measures the net return per unit of investment costs. It is calculated from the ratio between the NPV and present value of investment costs and it represents a comparison between the sum of all discounted net inflows (NPV) and the sum of discounted investment costs.

e) Relative Benefit Indicator: 1.027

The relative benefit indicator is the ratio between the present value of all the benefits of the project and the present value of the costs. The indicator needs to be greater than 1 for the investment to be justified.

f) Return on Equity (ROE): 13.6 %

The rate is equal to net profit divided by equity capital. Return on equity is expressed as a percentage. It is used as a universal indicator of a company's efficiency, as it shows how much profit a company can generate in terms of the sources provided by its shareholders. Equity capital represents the value of the assets of a group belonging to the owners of the parent company.

The selected variant of the project is acceptable. The investment repayment period is shorter than the service life of the project, the net present value (NPV) is positive, the internal rate of return (IRR) is higher than the average cost of the financing sources, the relative net present value (RNPV) is positive, the relative benefit indicator is greater than 1, and the return on equity is higher than in comparable projects and it also exceeds the return which will likely be prescribed by the RS sectoral policy for energy projects (9 %).

13.6 ECONOMIC CRITERIA

The economic evaluation proceeds from the assumption that the project inputs should be determined on the basis of their opportunity costs. The economic analysis is based on a corporate aspect. The financial flows from the financial analysis have been taken into account as the starting point of the economic analysis.

As already described in Section 1.2, the Guidance on the Methodology for carrying out Cost-Benefit Analysis for Investment Projects, prepared by the European Commission was taken into account in the calculations. The European Commission in the "Guidance on the Methodology for carrying out Cost-Benefit Analysis"
(http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf).

Results of the calculation:

Investment repayment period	15 years

NPV with a 5.5 % discount rate	356.8 million EUR
IRR	7.59 %
RNPV	0.449
Relative benefit indicator	1.096
Return on equity (ROE)	13.6 %

13.7 DEVELOPMENT CRITERIA

The investment meets the objectives of national economic, sectoral development and environment protection, if it achieves a certain percentage of available points, determined by sectoral methodology. Even though a Decree on the uniform methodology for the preparation and treatment of investment documentation in the field of public finance was published in the Official Gazette in 1998 and renewed in 2006, sectoral methodology has not been published to this date; therefore, an assessment of investment adequacy in terms of development criteria cannot be made.

However, as already described in Section 4 (Current situation analysis and reasons for the investment project), the Unit 6 project is a key development project in the Slovenian energy sector.

13.8. OPERATION OF ŠTPP WITH THE INVESTMENT

This section provides economic performance/viability calculations for the project – the construction of Unit 6. However, the new unit will operate alongside other production units of ŠTPP, which is why results of calculations for the operation of ŠTPP as a whole will be given hereafter.

The following input data are taken into account for ŠTPP as a whole:

a. For Unit 6, all data and calculations provided by this AIP.
b. For other units, expected business results for 2011 and long-term business projections, as well as the operating plan and shutdown of certain units.

The business projection for ŠTPP as a whole takes into account investments in tangible fixed assets, which are transferred into the business outcome through accrued and increased depreciation funds. Investments are planned to ensure the reliability of production in Units 3, 4 and 5 and common equipment of ŠTPP, taking into account the planned shutdown of production units. The other important set of investments is the planned investment maintenance (4-year overhaul cycle). The investments by year can be observed in Annex 7.

Tables 13.3 and 13.4 below present data on the production of electric power and consumption of fuel for existing units, gas turbines and Unit 6 and in production and the quantity of free CO_2 emission credits. Table 13.5 shows the price of coal and the sales price of electricity.

Table 13.6 gives an estimation of ŠTPP business results until 2054. Revenue and expenses of the existing units are summarized from the business plan for 2011 and a long-term business projection, taking into account predicted production and shutdown of existing units.

Table 13.3: Electric power generation (GWh) in existing units, gas turbines and Unit 6, and thermal power generation (GWh)

	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*
U1-U3	209.0	209.0	209.0	209.0				
U4	1,591.0	1,406.0	1,350.0	1,591.0				
U5	1,700.0	1,885.0	1,941.0	1,700.0	1,055.0	1,055.0	1,055.0	1,055.0
Total	3,500.0	3,500.0	3,500.0	3,500.0	1,055.0	1,055.0	1,055.0	1,055.0
U6					3,529.3	3,529.3	3,529.3	3,529.3
Total coal units	**3,500.0**	**3,500.0**	**3,500.0**	**3,500.0**	**4,584.3**	**4,584.3**	**4,584.3**	**4,584.3**
Gas turbines	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
TOTAL electricity ŠTPP	**3,690.0**	**3,690.0**	**3,690.0**	**3,690.0**	**4,774.3**	**4,774.3**	**4,774.3**	**4,774.3**
Heat generation	416.2	416.2	416.2	416.2	416.2	416.2	416.2	416.2
- U 4, 5	416.2	416.2	416.2	416.2	63.8	63.8	63.8	63.8
- U6					352.5	352.5	352.5	352.5

	2019	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*
U1-U3									
U4									
U5	1,055.0	1,055.0	955.0	855.0	755.0	655.0	545.0	445.0	345.0
Total	1,055.0	1,055.0	955.0	855.0	755.0	655.0	545.0	445.0	345.0
U6	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3
Total coal units	**4,584.3**	**4,584.3**	**4,484.3**	**4,384.3**	**4,284.3**	**4,184.3**	**4,074.3**	**3,974.3**	**3,874.3**
Gas turbines	190.0	190.0	172.0	154.0	136.0	118.0	98.2	80.1	62.1
TOTAL electricity ŠTPP	**4,774.3**	**4,774.3**	**4,656.3**	**4,538.3**	**4,420.3**	**4,302.3**	**4,172.5**	**4,054.4**	**3,936.4**
Heat generation	416.2	416.2	416.2	416.2	416.2	416.2	416.2	416.2	416.2
- U 4. 5	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8	63.8
- U6	352.5	352.5	352.5	352.5	352.5	352.5	352.5	352.5	352.5

	2028	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*
U6	3,837.9	3,717.9	3,598.0	3,478.1	3,358.1	3,238.2	3,118.3	2,998.3	2,878.4
TOTAL electricity ŠTPP	3,837.9	3,717.9	3,598.0	3,478.1	3,358.1	3,238.2	3,118.3	2,998.3	2,878.4
Heat generation	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3
- U6	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3

	2037	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*	*2044*	*2045*
U6	2,758.5	2,638.5	2,518.6	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7
TOTAL electricity ŠTPP	2,758.5	2,638.5	2,518.6	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7
Heat generation	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3
- U6	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3

	2046	*2047*	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
U6	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7
TOTAL electricity ŠTPP	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7
Heat generation	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3
- U6	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3	432.3

Table 13.4: Coal consumption in existing units and Unit 6 (000 t), natural gas consumption in gas turbines (million m^3), production, and free CO_2 quantity (000 tons)

	2011	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***
U1-U3	279.5	279.5	279.5	279.5				
U4	1,788.7	1,580.7	1,517.8	1,788.7				
U5	1,728.8	1,916.9	1,988.9	1,728.8	1,043.2	1,043.2	1,043.2	1,043.2
U6					2,927.9	2,927.9	2,927.9	2,927.9
Total	**3,796.9**	**3,777.1**	**3,786.1**	**3,796.9**	**3,971.2**	**3,971.2**	**3,971.2**	**3,971.2**
Heat	142.8	142.8	142.8	142.8	127.6	127.6	127.6	127.6
TOTAL	**3,939.7**	**3,919.8**	**3,928.8**	**3,939.7**	**4,098.8**	**4,098.8**	**4,098.8**	**4,098.8**
NG consumption	55.7	55.7	55.7	55.7	55.7	55.7	55.7	55.7
CO_2 generation	4,469.1	4,348.1	4,357.7	4,369.1	4,477.1	4,477.1	4,477.1	4,477.1
Free CO_2 quantity	4,300.8	4,300.8	97.1	79.3	63.7	50.1	38.5	29.4

	2019	***2020***	***2021***	***2022***	***2023***	***2024***	***2025***	***2026***	***2027***
U1-U3									
U4									
U5	1,043.2	1,043.2	944.3	845.5	746.6	647.7	538.9	440.0	341.2
U6	2,927.9	2,927.9	2,927.9	2,927.9	2,927.9	2,927.9	2,927.9	2,927.9	2,927.9
Total	**3,971.2**	**3,971.2**	**3,872.3**	**3,773.4**	**3,674.5**	**3,575.6**	**3,466.9**	**3,368.0**	**3,269.1**
Heat	127.6	127.6	127.6	127.6	127.6	127.6	127.6	127.6	127.6
TOTAL	**4,098.8**	**4,098.8**	**3,999.9**	**3,901.0**	**3,802.1**	**3,703.2**	**3,594.5**	**3,495.6**	**3,396.7**
NG consumption	55.7	55.7	50.4	45.1	39.9	34.6	28.8	23.5	18.2
CO_2 generation	4,477.1	4,477.1	4,363.3	4,249.5	4,135.8	4,022.0	3,876.8	3,753.0	3,629.2
Free CO_2 quantity	24.0	19.0							

	2028	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*
U6	3,070.3	2,970.3	2,870.3	2,770.3	2,670.3	2,570.3	2,470.3	2,370.3	2,270.3
Total	**3,070.3**	**2,970.3**	**2,870.3**	**2,770.3**	**2,670.3**	**2,570.3**	**2,470.3**	**2,370.3**	**2,270.3**
Heat	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7
TOTAL	**3,200.0**	**3,100.0**	**3,000.0**	**2,900.0**	**2,800.0**	**2,700.0**	**2,600.0**	**2,500.0**	**2,400.0**
CO_2 generation	3,516.1	3,410.5	3,304.9	3,199.3	3,093.7	2,988.1	2,882.5	2,776.9	2,671.3
Free CO_2 quantity									

	2037	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*	*2044*	*2045*
U6	2,170.3	2,070.3	1,970.3	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3
Total	**2,170.3**	**2,070.3**	**1,970.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**
Heat	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7
TOTAL	**2,300.0**	**2,200.0**	**2,100.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**
CO_2 generation	2,565.7	2,460.1	2,354.5	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9
Free CO_2 quantity									

	2046	*2047*	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
U6	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3	1,870.3
Total	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**	**1,870.3**
Heat	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7	129.7
TOTAL	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**
CO_2 generation	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9	2,248.9
Free CO_2 quantity									

Table 13.5: Sales price of electricity, coal price and price of emission credits

	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Price of electricity from coal (EUR/MWh)	55.50	60.20	72.98	73.12	73.83	74.90	75.97
Price of electricity from gas (EUR/MWh)	79.00	84.33	90.50	93.50	95.70	96.66	97.62
Price of coal (EUR/GJ)	2.55	2.50	2.40	2.30	2.25	2.26	2.27
Price of emission credits (EUR/t)	19.16	20.41	21.02	21.65	22.30	22.96	23.65

	2019	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*
Price of electricity from coal (EUR/MWh)	78.11	79.18	80.90	82.67	84.47	86.31	88.19
Price of coal (EUR/GJ)	99.59	100.58	101.59	102.60	103.63	104.67	105.71
Price of emission credits (EUR/t)	2.30	2.31	2.32	2.33	2.34	2.35	2.37
	24.50	24.93	25.37	25.82	26.79	27.79	28.82

	2028	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*
Price of electricity from coal (EUR/MWh)	92.35	93.79	95.24	97.08	98.96	100.87	102.82
Price of coal (EUR/GJ)	2.40	2.41	2.43	2.44	2.45	2.46	2.47
Price of emission credits (EUR/t)	32.17	33.37	34.62	35.89	37.21	38.58	40.00

	2037	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*
Price of electricity from coal (EUR/MWh)	108.90	111.01	113.16	115.34	117.57	119.85	122.16
Price of coal (EUR/GJ)	2.51	2.52	2.54	2.55	2.56	2.57	2.59
Price of emission credits (EUR/t)	44.59	46.23	47.94	49.70	51.53	53.43	55.40

	2046	2047	2048	2049	2050	2051	2052
Price of electricity from coal (EUR/MWh)	129.39	131.89	134.44	137.04	139.69	142.39	145.14
Price of coal (EUR/GJ)	2.63	2.64	2.65	2.67	2.68	2.69	2.71
Price of emission credits (EUR/t)	61.75	64.02	66.38	68.83	71.36	73.99	76.71

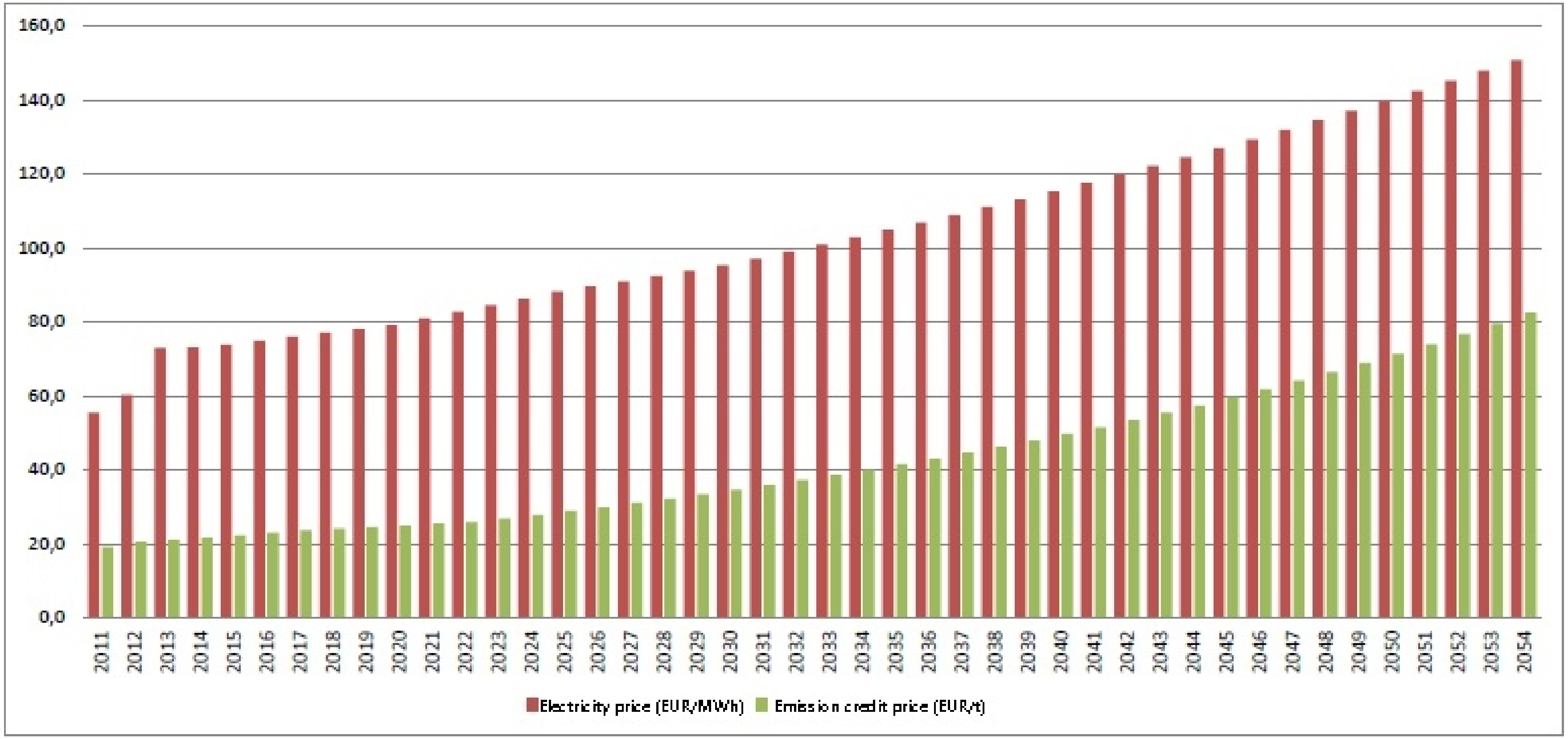


Image 13.1: Movement of electricity prices and CO_2 emission credit prices during the service life of the project

Prices of electricity and prices of emission credits until 2015 have been determined based on “future” prices on EEX and projections of HSE professional services, and adapted according to the specific operational regime of ŠTPP. The peak/base ratio from the latest available period and an average annual production of 3,600 GWh have been taken into account.

Prices of electricity and of emission credits between 2015 and 2030 have been taken from the NEP draft, which is already under discussion, and there have been no comments regarding this topic to this day.

Prices of electricity and of emission credits between 2030 and 2054 have been projected with the same growth dynamics that are predicted in the NEP draft for 2015 – 2030.

Prices of coal have been projected in accordance with the strategic plans of Premogovnik Velenje coal mine and they take into account real economic growth as projected in the NEP draft.

Table 13.6: Operating profit or loss in ŠTPP (000 EUR)

	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
REVENUE	**220,838.2**	**238,717.1**	**287,112.4**	**288,650.8**	**373,504.8**	**378,646.0**	**383,753.0**	**389,110.3**	**394,474.0**	**399,844.2**
1.Operating revenues	213,838.2	231,717.1	280,112.4	281,650.8	365,504.8	370,786.0	376,073.9	381,339.8	386,611.0	391,887.4
2. Other	2,000.0	2,000.0	2,000.0	2,000.0	2,000.0	1,800.0	1,558.6	1,588.7	1,619.4	1,650.7
3. Ancillary services	5,000.0	5,000.0	5,000.0	5,000.0	6,000.0	6,060.0	6,120.6	6,181.8	6,243.6	6,306.1
EXPENSES	**206,589.6**	**199,049.0**	**284,288.4**	**284,703.3**	**371,500.2**	**365,097.0**	**364,445.2**	**365,585.1**	**361,652.4**	**361,117.7**
1. Fuel	120,196.7	118,627.4	115,922.4	112,260.1	111,487.3	112,134.5	112,783.1	113,435.9	114,092.8	114,753.8
2. Maintenance	9,150.0	8,650.0	8,650.0	8,500.0	10,300.0	9,300.0	9,300.0	11,100.0	11,100.0	11,100.0
3. Labour costs	15,010.5	14,945.5	14,058.0	14,058.0	14,058.0	14,198.6	13,435.2	13,386.7	12,966.4	12,723.0
4. Depreciation	33,917.4	32,224.8	32,926.0	34,072.4	73,736.4	66,475.9	65,785.6	65,397.3	62,149.1	62,086.4
5. Other costs	23,774.1	22,774.1	22,774.1	22,774.1	24,613.9	24,791.1	24,719.0	24,772.0	24,825.2	24,878.8
6. Financing costs	1,316.6	861.5	401.0	163.8	41,710.6	39,440.7	36,440.4	33,480.7	30,528.8	27,576.8
7. CO_2 emission credits	3,224.3	965.7	89,556.8	92,874.9	95,593.9	98,756.2	101,981.9	104,012.6	105,990.1	107,998.9
PROFIT/LOSS	**14,248.6**	**39,668.1**	**2,824.0**	**3,947.6**	**2,004.6**	**13,549.0**	**19,307.8**	**23,525.2**	**32,821.7**	**38,726.5**
Income tax	2,849.7	7,933.6	564.8	789.5	400.9	2,709.8	3,861.6	4,705.0	6,564.3	7,745.3
NET PROFIT/LOSS	**11,398.9**	**31,734.5**	**2,259.2**	**3,158.0**	**1,603.7**	**10,839.2**	**15,446.2**	**18,820.2**	**26,257.3**	**30,981.2**

	2021	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*
REVENUE	**398,064.1**	**396,065.4**	**393,875.4**	**391,441.9**	**387,656.1**	**382,486.9**	**377,074.5**	**369,790.8**	**364,294.7**	**360,911.5**	**353,784.7**	**348,712.5**
1.Operating revenues	390,012.3	387,917.4	385,629.9	383,097.7	379,211.7	373,941.2	368,426.0	363,314.4	357,735.6	351,896.5	347,056.6	341,898.1
2. Other	1,682.6	1,715.2	1,748.3	1,782.1	1,816.6	1,851.7	1,887.5	1,924.0	1,961.2	1,999.1	2,037.8	2,077.2
3. Ancillary services	6,369.1	6,432.8	6,497.1	6,562.1	6,627.7	6,694.0	6,761.0	4,552.4	4,597.9	7,015.9	4,690.3	4,737.2
EXPENSES	**354,241.4**	**339,438.2**	**333,321.8**	**327,001.8**	**320,060.0**	**313,618.5**	**305,171.1**	**279,266.4**	**275,000.2**	**270,886.4**	**267,109.5**	**263,279.8**
1. Fuel	111,266.5	107,724.3	104,126.7	100,472.9	96,335.0	92,563.7	88,734.2	80,442.2	78,318.0	76,170.6	73,999.8	71,805.3
2. Maintenance	11,100.0	11,100.0	11,100.0	11,100.0	11,100.0	11,100.0	11,100.0	7,008.8	6,858.6	6,708.3	6,558.0	6,407.7
3. Labour costs	12,435.7	12,179.5	11,916.8	11,647.7	11,372.1	11,089.7	10,400.6	8,080.5	8,161.3	8,242.9	8,325.3	8,408.6
4. Depreciation	61,796.8	54,643.6	54,285.8	53,865.8	53,784.7	53,566.2	52,005.3	47,988.7	46,762.5	45,825.6	45,422.4	45,122.6
5. Other costs	24,373.6	23,868.7	23,364.1	22,859.8	22,299.8	21,796.1	20,796.3	13,945.1	13,778.3	13,610.9	13,442.8	13,274.1
6. Financing costs	25,757.8	23,440.2	21,122.7	18,805.1	16,487.5	14,169.9	12,252.6	11,031.7	9,810.8	8,589.9	7,369.0	6,148.1
7. CO_2 emission credits	107,511.0	106,481.9	107,405.8	108,250.5	108,680.8	109,332.8	109,882.2	110,769.4	111,310.7	111,738.2	111,992.3	112,113.4
PROFIT/LOSS	**43,822.7**	**56,627.2**	**60,553.6**	**64,440.1**	**67,596.1**	**68,868.4**	**71,903.3**	**90,524.4**	**89,294.5**	**90,025.0**	**86,675.2**	**85,432.8**
Income tax	8,764.5	11,325.4	12,110.7	12,888.0	13,519.2	13,773.7	14,380.7	18,104.9	17,858.9	18,005.0	17,335.0	17,086.6
NET PROFIT/LOSS	**35,058.2**	**45,301.8**	**48,442.9**	**51,552.1**	**54,076.9**	**55,094.7**	**57,522.7**	**72,419.5**	**71,435.6**	**72,020.0**	**69,340.2**	**68,346.2**

	2033	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*	*2044*
REVENUE	**343,312.3**	**337,573.4**	**331,484.6**	**325,034.6**	**318,211.7**	**311,003.9**	**303,398.9**	**295,384.0**	**301,047.1**	**306,819.3**	**312,702.6**	**318,699.1**
1.Operating revenues	336,410.4	330,582.7	324,403.8	317,862.5	310,947.0	303,645.2	295,944.8	287,833.2	293,398.2	299,070.9	304,853.2	310,747.3
2. Other	2,117.3	2,158.3	2,200.0	2,242.5	2,285.9	2,330.1	2,375.1	2,421.1	2,467.9	2,515.6	2,564.2	2,613.8
3. Ancillary services	4,784.6	4,832.4	4,880.8	4,929.6	4,978.9	5,028.7	5,078.9	5,129.7	5,181.0	5,232.8	5,285.2	5,338.0
EXPENSES	**258,853.0**	**253,565.8**	**249,476.4**	**245,183.9**	**240,978.3**	**237,181.7**	**233,458.9**	**230,454.3**	**234,795.2**	**239,285.7**	**243,925.2**	**248,730.5**
1. Fuel	69,587.0	67,344.8	65,078.3	62,787.6	60,472.3	58,132.3	55,767.4	53,377.3	53,644.2	53,912.4	54,182.0	54,452.9
2. Maintenance	6,257.5	6,107.2	5,956.9	5,806.6	5,656.4	5,506.1	5,355.8	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9
3. Labour costs	8,492.6	8,577.6	8,663.3	8,750.0	8,837.5	8,925.9	9,015.1	9,105.3	9,196.3	9,288.3	9,381.2	9,475.0
4. Depreciation	44,392.2	42,978.8	42,951.9	42,922.6	42,922.6	42,922.6	42,922.6	42,922.6	42,913.3	42,905.9	42,894.5	42,890.3
5. Other costs	13,104.9	12,935.2	12,765.2	12,594.9	12,424.4	12,254.0	12,083.7	11,586.0	11,638.5	11,691.4	11,744.5	11,797.9
6. Financing costs	4,927.1	3,706.2	2,485.3	1,264.4	314.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. CO_2 emission credits	112,091.6	111,916.0	111,575.4	111,057.8	110,350.8	109,440.9	108,314.3	106,956.3	110,896.0	114,980.8	119,216.1	123,607.4
PROFIT/LOSS	**84,459.4**	**84,007.6**	**82,008.2**	**79,850.7**	**77,233.4**	**73,822.2**	**69,940.0**	**64,929.6**	**66,251.9**	**67,533.6**	**68,777.4**	**69,968.7**
Income tax	16,891.9	16,801.5	16,401.6	15,970.1	15,446.7	14,764.4	13,988.0	12,985.9	13,250.4	13,506.7	13,755.5	13,993.7
NET PROFIT/LOSS	**67,567.5**	**67,206.1**	**65,606.6**	**63,880.5**	**61,786.7**	**59,057.8**	**55,952.0**	**51,943.7**	**53,001.5**	**54,026.9**	**55,021.9**	**55,974.9**

	2045	*2046*	*2047*	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
REVENUE	**324,811.1**	**331,040.8**	**337,390.4**	**343,862.3**	**350,458.8**	**357,182.3**	**364,035.2**	**371,020.2**	**378,139.6**	**391,020.2**
1.Operating revenues	316,755.4	322,879.6	329,122.3	335,485.6	341,972.0	348,583.8	355,323.4	362,193.3	369,196.1	376,334.2
2. Other	2,664.3	2,715.9	2,768.4	2,821.9	2,876.4	2,932.1	2,988.8	3,046.5	3,105.4	8,789.5
3. Ancillary services	5,391.4	5,445.3	5,499.8	5,554.8	5,610.3	5,666.4	5,723.1	5,780.3	5,838.1	5,896.5
EXPENSES	**213,088.9**	**218,233.0**	**223,553.7**	**229,057.2**	**234,750.4**	**240,617.0**	**246,565.5**	**252,869.9**	**259,393.1**	**266,143.0**
1. Fuel	54,725.2	54,998.8	55,273.8	55,550.2	55,827.9	56,107.1	56,387.6	56,669.5	56,952.9	57,237.6
2. Maintenance	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9
3. Labour costs	9,569.7	9,665.4	9,762.1	9,859.7	9,958.3	10,057.9	10,158.5	10,260.0	10,362.6	10,466.3
4. Depreciation	2,275.0	2,275.0	2,275.0	2,275.0	2,275.0	2,251.9	2,107.2	2,107.2	2,107.2	2,107.2
5. Other costs	11,851.7	11,905.7	11,960.0	12,014.6	12,069.6	12,124.8	12,180.3	12,236.2	12,292.3	12,348.8
6. Financing costs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. CO_2 emission credits	128,160.5	132,881.2	137,775.9	142,850.8	148,112.7	153,568.4	159,225.1	165,090.1	171,171.2	177,476.3
PROFIT/LOSS	**111,722.2**	**112,807.8**	**113,836.7**	**114,805.1**	**115,708.4**	**116,565.3**	**117,469.7**	**118,150.3**	**118,746.5**	**124,877.2**
Income tax	22,344.4	22,561.6	22,767.3	22,961.0	23,141.7	23,313.1	23,493.9	23,630.1	23,749.3	24,975.4
NET PROFIT/LOSS	**89,377.8**	**90,246.2**	**91,069.4**	**91,844.0**	**92,566.7**	**93,252.2**	**93,975.8**	**94,520.2**	**94,997.2**	**99,901.8**

14. SENSITIVITY AND RISK ANALYSIS

14.1 SENSITIVITY ANALYSIS

In the context of the evaluation, the project's sensitivity to changes in coal prices, changes in electricity sales prices, changes in the prices of emission credits and changes of the investment value were also analysed.

The following changes were taken into account:
a) Coal price increase of 10 and 20 %
b) Coal price decrease of 10 and 20 %
c) Electricity sales price increase of 10 and 15 %
d) Electricity sales price decrease of 10 and 15 %
e) Emission credit sales price increase of 10 and 20 %.
f) Emission credit sales price decrease of 10 and 20 %.
g) Increase of the discount factor to 9 %.
h) Decrease of the discount factor to 3.5 %.

The results of the sensitivity analysis are given in Tables 14.1 – 14.3.

Table 14.1: Net present value, internal rate of return, and return on equity in the sensitivity analysis

Sensitivity to the price of coal

	-20 %	**-10 %**		**+10 %**	**+ 20 %**
NPV (000 EUR)	195,151.4	139,327.9	83,504.5	27,681.0	-28,142.4
IRR	8.35 %	7.97 %	7.59 %	7.20 %	6.80 %
ROE	15.80 %	14.7 %	13.60 %	12.51 %	11.41 %

Considering that coal from the Premogovnik Velenje coal mine is predominantly used in ŠTPP and that the latter is in direct vicinity of the mine and also directly connected with it by means of coal transport conveyors, we estimate that the probability of a major change of the price of coal in the future is relatively low. Additionally, the owner of PV is the same as the owner of ŠTPP. The analysis shows that, considering other indicators, the project is relatively insensitive to coal price changes.

Sensitivity to the sales price of electricity

	+15 %	***+10 %***		***-10 %***	***-15 %***
NPV (000 EUR)	446,659.2	325,607.6	83,504.5	-158,598.6	-284,097.6
IRR	9.89 %	9.16 %	7.59 %	5.79 %	4.73 %
ROE	21.51 %	18.87 %	13.60 %	8.34 %	5.67 %

The sensitivity analysis shows that the project is relatively heavily dependent on the price of electricity. In light of the crisis that followed the events at the Fukushima nuclear power plant in Japan and the consequent increase of nuclear safety and scepticism towards the nuclear programme, the probability of sales prices of electricity decreasing is relatively low. We estimate that all the developments in the field of electricity production in nuclear power plants will be reflected in an increase of the price of electricity (which is also the assumption of the Ministry of the Economy in the NEP draft), which will have a positive impact on the financial performance of the investment. If we also take into account the exceptionally high prices from alternative energy sources, which are still entitled to subsidies due to exceedingly high costs, we believe that our arguments are based on solid foundations.

Sensitivity to the sales price of emission credits

	+20 %	**+10 %**		**-10 %**	**-20 %**

NPV (000 EUR)	-69,531.8	6,986.3	83,504.5	160,022.6	236,540.7
IRR	6.48 %	7.05 %	7.59 %	8.10 %	8.85 %
ROE	9.79 %	11.70 %	13.60 %	15.51 %	17.42 %

In accordance with the existing legislation, all electric power producers will have to purchase CO_2 emission credits on the free market of emission credits after 2012. We would like to stress that historically, the correlation between the price of emission credits and the price of electricity has been extremely strong, as a 1 EUR change in the price of emission credits also increased the price of electricity by 1 EUR, which is shown in the chart below and which is also in accordance with the assumptions of the Ministry of the Economy in the NEP draft. In view of the above, it is almost impossible to expect high growth of emission allowance prices that would not be followed by a growth of electricity prices, which would consequentially have a distinctly negative impact on the financial performance of the investment. On the contrary: taking into account trends in the past and the fact that Unit 6 is the latest technology with an emission factor substantially lower than 1, an increased price of emission credits would mean an **improvement** of the financial performance of the project.

Image 14.1: Movement of emission allowance prices and electricity prices

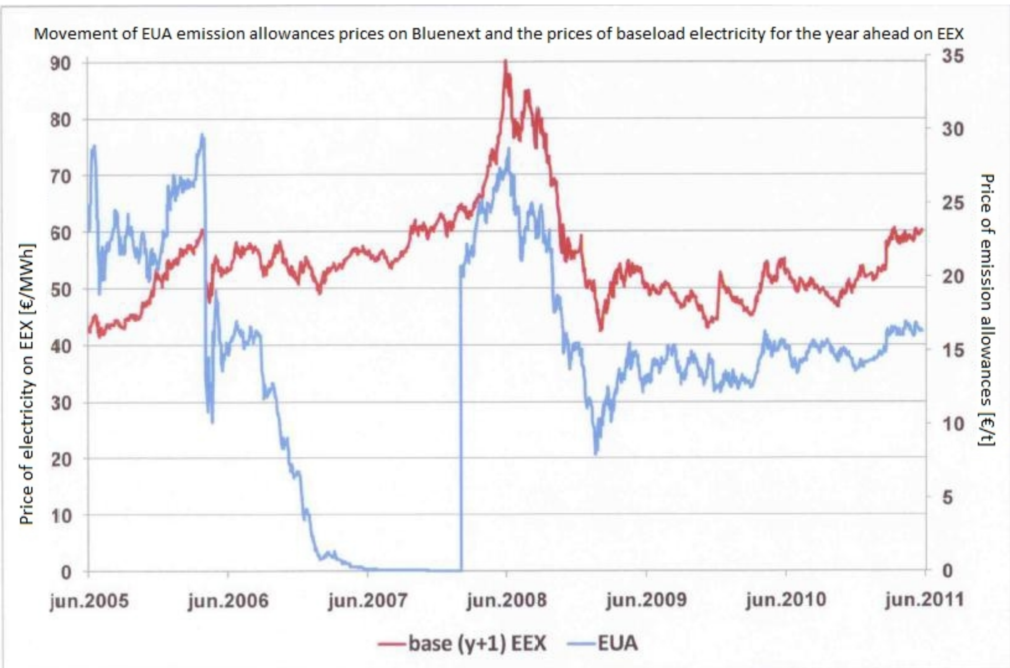


Table 14.2: Net present value of the investment, internal rate of return and cost price of electricity if the value of the investment increases by 100 million or by 200 million EUR

Investment increase (million EUR)	100	200
NPV (000 EUR)	1,788.4	-79,928.8
IRR	7.01 %	6.50 %
ROE	13.16 %	12.75 %

Table 14.3: Net present value and internal rate of return at certain discount factors

Discount factor	3.5	9
NPV (000 EUR)	922,288.8	-160,170.7
IRR	7.59 %	7.59 %

Discount factor is 9 %:

As described in one of the previous sections, the theory of economics teaches us that the discount factor is determined based on the price at which funding sources can be obtained on the market. Considering that the contracts for debt financing sources have already been signed an that the expenses are known, the estimated return on equity with a projected 9 % discount factor is 18 %. Return this high is very unusual for the energy production sector and expectations of owners do not normally reach such high expected returns. The Republic of Slovenia, the indirect owner of ŠTPP, will therefore not only benefit from the direct return on the invested capital, but also from high taxes on the expected profit, payment of taxes for greenhouse gas CO_2 emission, a high level of employment, the income from guarantee fees for the loan with the EIB, which will reach ca. 50 million EUR during the time of the loan, and from many other synergistic effects of the investment. Taking into account the listed facts, the return for RS as the owner will far surpass 30 %.

Discount factor is 3.5 %:

In the "Guidance on the Methodology for carrying out Cost-Benefit Analysis", the European Commission suggests a 3.5 % discount factor for investments with strong synergistic effects, which undoubtedly holds true for the content of the Unit 6 project. However, this discount factor is only used for investments in countries which are developed enough for the GDP per capita to exceed 90 % of the European Union average. The factor above is therefore only used in the most developed European countries. For Slovenia and other countries which have yet to achieve this average, a 5.5 % discount factor is proposed. Considering the fact that Slovenia's GDP is very close to the threshold, the use of the lower discount factor (3.5 %) is entirely reasonable. It is an uncontested fact that using the 3.5 % discount factor substantially decreases the cost and return on capital, the latter reaching only 3.5 % with a 3.5 % discount factor. It is, however, also true that the owner (RS) enjoys all other benefits described (income tax, revenue from the CO_2 emission tax, revenue from the issued guarantee, high employment rate in the region and the consequential lower costs of social transfers …). All the mentioned and other positive effects have been taken into account by the European Commission when determining the discount factors, and as a result the neutral factor for the country was set at 3.5 %.

If using the 3.5 % discount factor, the investment is exceptionally flexible to changes of all key parameters and therefore, naturally, much more acceptable.

14.2 RISK ANALYSIS

For the purpose of the investment in Unit 6, ŠTPP as well as the parent company HSE have prepared comprehensive documents which cover and assess all recognised risks associated with the Unit 6 project. Their definition of risk obviously varies to some extent due to their different roles in the project. Therefore, there are differences in their risk management measures. While ŠTPP pays more attention to technical and environmental aspects, financial and economic aspects prevail with HSE. The key recognised risks, their ranking according to importance, projected measures, and degree of manageability are summarized below.

14.2.1 THE METHODOLOGY USED AND THE BASIS

The basis for the methodology used for the risk analysis is:

- ISO 31000 family of standards
  - ISO 31000:2009 – Principles and Guidelines on Implementation
  - ISO/IEC 31010: 2009 – Risk Management – Vocabulary
  - ISO Guide 73:2009 – Risk Management – Risk Assessment Techniques

All the key contracts relating to Unit 6 (also described in the sources) have been examined for the risk analysis, as well as the risks perceived by the investor in relation to the construction of Unit 6 that could present a potential risk.

14.2.2 DETERMINING THE RISK ELEMENTS

To identify risks, a matrix of potential risk categories by the following areas was used:

FS	Risks relating to the acquisition of funding sources for the construction of Unit 6
IV	Risks relating to the investment value of the project
SC	Risks relating to the project not being completed in accordance with the schedule
CO	Risk of an insufficient amount or inadequate quality of coal
MR	Market risk relating to the price of electricity and emission credits
LE	Risk of environmental legislation becoming stricter

14.2.3 RISK CLASSIFICATION

Degree of impact:

Category	Degree of impact	Risk expenses	Possible delay
1	Negligible impact on the project	Up to 10 million EUR	Up to 14 days
2	Little impact on the project	11 to 100 million EUR	14 to 45 days
3	Medium impact on the project	101 to 350 million EUR	45 to 90 days
4	Major impact on the project	351 to 600 million EUR	90 to 150 days
5	Catastrophic impact on the project	Over 600 million EUR	Over 150 days

Degree of probability:

Category	Degree of probability	Available information on probability
VH	Very high (>80 %)	Almost no information is available
H	High (60 – 80 %)	Only limited, partial information is available
M	Medium (40 – 60 %)	Only part of the information is available
L	Low (20 – 40 %)	Good information is available
VL	Very low (<20 %)	Very good information is available

Degree of risk:

Category	Degree of risk
l	Low risk
m	Medium risk
h	High risk
vh	Very high risk

Estimated risk manageability:

Category	Degree of manageability	Description of the circumstances
1	Low manageability	External impacts and influential factors, legislation, environment
2	Tolerable manageability	Internal and external impacts, minor legislation and environmental issue impacts
3	Good manageability	Internal impacts, high degree of feasibility and enforceability, moderate risk

14.2.4 TABLE OF RISKS

Code	Risk element and impact	Risk category	Measures for decreasing risk / Comments	Degree of manageability
FS1	ŠTPP fails to draw the EIB A loan in the amount of 110 million EUR	l (L, 2)	Timely provision of a commercial guarantee and compliance with commitments under the contract.	3
FS2	Risk due to changes in interest rates	l (VL, 2)	ŠTPP has an established policy of hedging interest rates which disperses the risk of interest rate changes.	3
FS3	The HSE Group fails to provide sufficient resources for a capital increase and loans within the group	l (VL, 3)	By establishing long-term cash flow planning and with established "cash management" within the HSE Group, the probability is very low.	3
FS4	ŠTPP fails to draw the EBRD loan	m (L, 3)	Timely compliance with all conditions for drawdown and fulfilment of commitments in accordance with contracts concluded.	2
FS5	ŠTPP fails to ensure own funds needed for the loan	h (H, 3)	Implementing streamlining measures, adopting plans and dynamics of ensuring own funds, ensuring an adequate pricing policy by the parent company.	3
FS6	Risk that the Republic of Slovenia does not issue a guarantee for the EIB B loan in the amount of 440 million EUR	h (L, 5)	Considering that the Republic of Slovenia has already issued all necessary consents for this project, a letter of support for the EBRD, and a "no objection" letter for the EIB, the probability of the RS not approving the guarantee is low.	1
IV1	Risk that the value of the Main technological equipment (MTE) exceeds the value predicted in the investment programme	m (L, 3)	The investor has examined all possible price increases for the MTE in the investment programme. The investor is in the final stage of negotiations with the supplier Alstom on the limitation of price escalation from the escalation formula which is part of the contract. Other parameters of the MTE supply contract will be manageable with the cap on escalation.	2
IV2	Risk that the value of assembly exceeds the value predicted in the investment programme	m (M, 3)	The investor has obtained informative bids for the price of assembly from other comparable projects and directly from companies providing similar assembly work. The estimated value of the assembly is based on the information acquired. It is estimated that the value of the assembly cannot significantly exceed the value from the investment programme.	2

IV3	Risk that the value of the investment in the Desulphurisation plant (FGD) exceeds the value predicted in the investment programme	l (L, 2)	The investor has reached an agreement with the FGD supplier on excluding an escalation formula from the contract, as well as an agreement on the amount of additional work required to comply with environmental criteria and the environmental permit. The described risk is estimated to be low.	3
IV4	Risk of a price increase of all other packages from the investment programme	l (L, 2)	The investor has assessed all package expenses in the investment programme to the best of their knowledge. It is estimated that a potential increase of the package values cannot substantially increase the investment value of the project. In addition, the investor will closely monitor the package values and take immediate action in case of potential discrepancies.	3
SC1	Risk that the construction of the main power facility will not be completed within the time schedule	h (H, 3)	Given that the work in question is earthmoving work with a variety of unpredictable scenarios possible, the probability of a delay is quite high. The investor will provide all necessary supervision, continuously monitor compliance with the schedule, and ensure that there are no delays or at least that they are minimal.	3
SC2	Risk that the construction of the cooling system will not be completed within the time schedule	m (M, 3)	Given that the work in question is earthmoving work with a variety of unpredictable scenarios possible, the probability of a delay is quite high. The investor will provide all necessary supervision, continuously monitor compliance with the schedule, and ensure that there are no delays or at least that they are minimal. Compared to the MTE, the construction work for the cooling system has a lower degree of risk and less consequences, as the construction of the cooling system is not directly linked to the beginning of the MTE assembly work.	3
SC3	Risk that the investment in the FGD will not be realised in accordance with the time schedule	m (L, 3)	The suppliers of the FGD are reputable and experienced companies and can therefore be expected to complete their work on time and in good quality; however, delays are still an option. The investor will therefore provide all necessary supervision, continuously monitor compliance with the schedule, and ensure that there are no delays or at least that they are minimal.	3

SC4	Risk the that MTE will not be installed in accordance with the time schedule	h (M, 4)	The supplier of the MTE is a reputable and experienced company and can therefore be expected to complete their work on time and in good quality; however, delays are still an option, especially due to the extremely high complexity of the investment and a number of related events which are impossible to predict at this stage. The investor will provide supervision for the production of the key elements of the investment and construction site supervision, thereby ensuring to the best of their power and knowledge that there are no delays or at least that they are minimal.	2
SC5	Risk of optimal operation of the project team	l (L,1)	The risk implies that it is possible that the project team will not be complete or fully operational. The investor has been constantly supervising and supplementing the project team and thereby managing almost all the related risks.	3
MR1	Risk that the prices projected in the investment programme will not be achieved	m (L, 4)	The investor quoted the prices from the upcoming National energy programme draft. Given that the NEP draft has been prepared by the topmost energy field experts in RS, it can be considered authoritative, and it is probable that the prices in the NEP draft and consequentially the investment programme will be achieved. The dispersion of production within the HSE Group is an additional guarantee that the appropriate prices will be achieved, as it allows for a production source to connect to the system at an optimal time, thus ensuring the optimum sales price.	2
MR2	Risk that the prices of emission credits will be higher than those projected in the IP	m (L, 3)	The investor quoted the prices from the upcoming National energy programme draft. Given that the NEP draft has been prepared by the topmost energy field experts in RS, it can be considered authoritative, and it is probable that the prices in the NEP draft and consequentially the investment programme are appropriate. The dispersion of production within the HSE Group is an additional guarantee that the appropriate prices will be achieved, as it allows for a production source to connect to the system at an optimal time, thus ensuring the optimum sales price. It is also important to emphasize that, historically, the price of electricity increasing for 1 unit has caused an increase of the emission credits price by less than 1 unit, which shows that the probability of the price of emission credits increasing without an increase of the price of electricity is reasonably low.	

CO1	Risk that the coal price projected in the investment programme will not be achieved	m (M, 3)	The Premogovnik Velenje (PV) coal mine is obliged to achieve a price of 2.25 EUR/GJ by the beginning of the construction of Unit 6. PV is already implementing measures to achieve this price in accordance with their commitment. PV's capability of achieving the target price was also confirmed by a coal reserves study conducted by German company IMC-Montan Consulting GmbH in February 2011.	2
CO2	Risk that the calorific value of coal will not reach the guaranteed value	m (L, 3)	PV had presented the quality of coal it is capable of ensuring for Unit 6 at the beginning of the construction of Unit 6. The quality was also confirmed by German company IMC-Montan Consulting GmbH. There is a risk that the actual quality of coal is lower than the projected quality; unfortunately, this risk is uncontrollable, but also relatively small.	1
CO3	Risk that the excavation reserves of coal are lower than projected	l (L, 2)	PV had presented the excavation reserves of coal it is capable of providing for Unit 6 at the beginning of the construction of Unit 6. The excavation reserves were also confirmed by German company IMC-Montan Consulting GmbH. There is a risk that the actual excavation reserves are lower than the projected ones; unfortunately, this risk is uncontrollable, but also relatively small. It is important to emphasize that there are additional reserves of coal, which, however, cannot be excavated with the currently known excavation methods without consequences. In case technologies are developed in the future, the extraction of these reserves will be possible and the risk relating to coal quantities required for Unit 6 eliminated.	1
LE1	Risk that environmental legislation becomes stricter	m (L, 4)	Environmentally, Unit 6 is one of the most modern coal-fired power plants in the world. Projected emissions are substantially lower than those required under European legislation. In case environmental legislation becomes stricter, Unit 6 has a relatively wide margin for additional restrictions. Regardless of the fact the Unit 6 is designed to have ample space for meeting any additional environmental requirements in the event of additional environmental constraints, it is true that the realisation of these additional investments would represent a significant financial challenge for ŠTPP.	2

14.2.5 RISK MATRIX

Impact Probability	Negligible	Little	Medium	Major	Catastrophic
Very high					
High			FS5, SC1		
Medium			IV2, SC2, CO1	SC4	
Low	SC4	FS1, IV3, IV4, CO3	FS4, IV1, SC3, MR2, CO2	MR1, LE1	FS6
Very low		FS2	FS3		

Degree of risk

Low	**Medium**	**High**	**Very high**

14.2.6 FINAL RISK ASSESSMENT

The investor has considered all the key identified risks and assessed their probability. The risk analysis, consistent monitoring, and taking action ensures that potential emerging risks are as manageable as possible.

Based on the risk assessment, the investor and its parent company have already implemented or are currently implementing measures of risk management during the project preparation and implementation stage:

- Negotiations for signing Annex 2 (completed, elimination of 18.5 % of the contract value from escalation) and Annex 3 to the contract (in the final stage)
- Production of expert studies by independent organisations to confirm the investment decision, technology, coal supply
- Continuous improvement of project organisation and personnel additions to the team
- Forming the Project council and including NGO's, the local community and other interested public in this body
- Continuous monitoring, analysing the credit rating of contractual partners, and preventing excesses on their part

BASED ON THE RISK ANALYSIS AND THE RISK MATRIX, THE INVESTOR ŠTPP, HSE AS THE PARENT COMPANY, HAVE ASSESSED THAT THE **PROJECT PRESENTS A MEDIUM RISK AND THAT THE PROJECTED AND PROCESSED RISKS ARE MANAGEABLE** AND AT THE LEVEL OF RISK FOR SUCH PROJECTS.

15. SOURCES

1. Construction of Unit 6 in Šoštanj Thermal Power Plant – Pre-investment study (April 2005)
2. Thermodynamic analysis of the circular process in Unit 6 of Šoštanj Thermal Power Plant (April 2005)
3. Construction of Unit 6 in Šoštanj Thermal Power Plant: Identification document for the investment project (May 2005)
4. Construction of Unit 6 in Šoštanj Thermal Power Plant: Pre-investment concept (July 2005)
5. Draft project: Unit 6 in Šoštanj Thermal Power Plant (January 2006)
6. Aspects of including Unit 6 of Šoštanj Thermal Power Plant in the electricity system of Slovenia (June 2005)
7. Konzeptstudie Referenzkraftwerk Nordrhein-Westfalen (February 2004)
8. Environmental impact report – Preliminary assessment of the acceptability of interventions for the construction of Unit 6 in Šoštanj Thermal Power Plant (November 2005)
9. A comparison of an investment for a 600 MW unit compared to 520 MW and 650 MW units (March 2006)
10. Construction of Unit 6 with a power of 600 MW in Šoštanj Thermal Power Plant – Investment programme (April 2006)
11. Implementation study: Construction of the 600 MW Unit 6 in Šoštanj Thermal Power Plant (January 2009)
12. Construction of the 600 MW Unit 6 in Šoštanj Thermal Power Plant – Amended investment programme (September 2007), and rev. 2 (March 2009)
13. Information and recommendations of the STEAG corporation
14. Contract for the supply and installation of the main technical equipment (Alstom)
15. Contract for the supply and installation of the flue gas desulphurisation equipment in Unit 6 (Rudis-Esotech-Engineering Doberšek Consortium)
16. Long-term business projection for Šoštanj Thermal Power Plant 2009–2018
17. HSE data
18. Šoštanj Thermal Power Plant data

16. ANNEXES

Annex 1: Construction time schedule

Annex 2: Production costs, production and price of electric power

Annex 3: Revenue and expenses of the project

Annex 4: Project liquidity

Annex 5: Economic flow of the project

Annex 6: Amortization schedule of loans

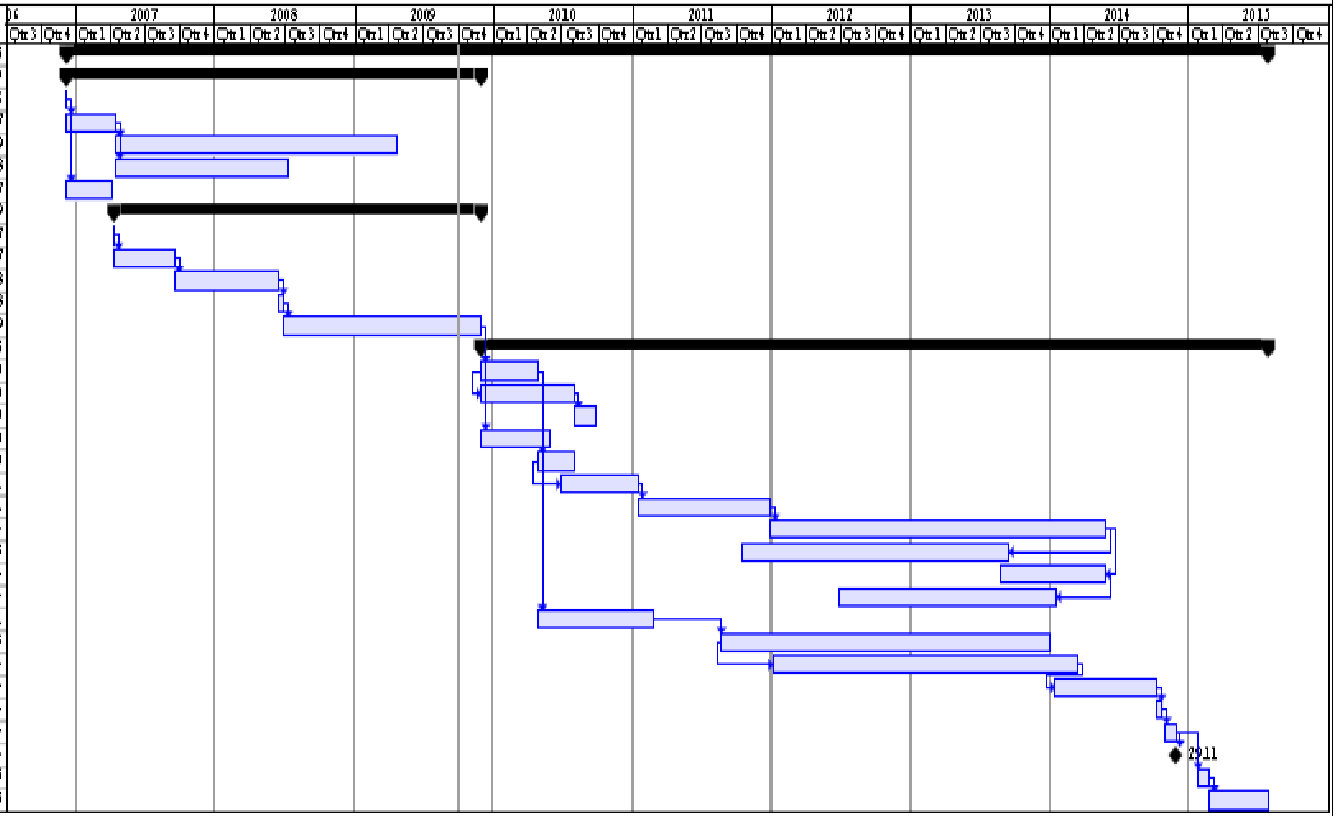
Annex 7: Other investments of Šoštanj Thermal Power Plant

Annex 8: Cash flow table for Šoštanj Thermal Power Plant with the investment

Annex 9: Alternatives to construction of Unit 6 on the Slovene electricity market

Annex 1: Construction time schedule

ID	Task Name	Duration	Start	Finish
0	Postavitev bloka 6 TEŠ	3154 days	Fri 8.12.06	Mon 27.7.15
1	Predhodna dela	1090 days	Fri 8.12.06	Tue 1.12.09
2	Kvalifikacija ponudnikov	1 day	Fri 8.12.06	Fri 8.12.06
3	PVO	128 days	Sat 9.12.06	Sun 15.4.07
4	Okoljevarstveno soglasje	740 days	Mon 16.4.07	Fri 24.4.09
5	Občinski podrobni prostorski načrt	450 days	Mon 16.4.07	Tue 8.7.08
6	PZR	120 days	Sat 9.12.06	Sat 7.4.07
7	Razpis	965 days	Thu 12.4.07	Tue 1.12.09
8	Povabilo za oddajo ponudb	1 day	Thu 12.4.07	Thu 12.4.07
9	Pogodba o nominaciji	159 days	Fri 13.4.07	Tue 18.9.07
10	Ponudbe in pogajanja	271 days	Wed 19.9.07	Sun 15.6.08
11	Pogodba	13 days	Mon 16.6.08	Sat 28.6.08
12	Veljavnost pogodbe	521 days	Sun 29.6.08	Tue 1.12.09
13	Gradnja	2064 days	Wed 2.12.09	Mon 27.7.15
14	Podloge za PGD	150 days	Wed 2.12.09	Fri 30.4.10
15	PGD	240 days	Wed 2.12.09	Thu 29.7.10
16	Gradbeno dovoljenje	60 days	Fri 30.7.10	Mon 27.9.10
17	Podloge za ostale pakete	180 days	Wed 2.12.09	Sun 30.5.10
18	Podloge za grad. projektiranje	90 days	Sat 1.5.10	Thu 29.7.10
19	PZI gradbeni del	200 days	Wed 30.6.10	Sat 15.1.11
20	Groba gradbena dela	350 days	Sun 16.1.11	Sat 31.12.11
21	Ostala gradbena dela GTO	880 days	Sun 1.1.12	Thu 29.5.14
22	Gradnja hladilnega stolpa	700 days	Tue 18.10.11	Mon 16.9.13
23	Gradbene instalacije	280 days	Fri 23.8.13	Thu 29.5.14
24	Gradnja RTP	570 days	Fri 29.6.12	Sun 19.1.14
25	PZI GTO	300 days	Sat 1.5.10	Thu 24.2.11
26	Dobava opreme	840 days	Wed 24.8.11	Mon 30.12.13
27	Montaža opreme	800 days	Fri 6.1.12	Sat 15.3.14
28	Zagonski preizkusi	270 days	Wed 15.1.14	Sat 11.10.14
29	Tehnični pregled	14 days	Sun 12.10.14	Sat 25.10.14
30	Poskusno obratovanje	30 days	Fri 31.10.14	Sat 29.11.14
31	Začetni prevzem	0 days	Sat 29.11.14	Sat 29.11.14
32	Garancijske meritve	30 days	Thu 29.1.15	Fri 27.2.15
33	Uporabno dovoljenje	150 days	Sat 28.2.15	Mon 27.7.15



Annex 2: Production costs, production, and price of electricity produced (in 000 EUR)

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*
1. Coal	68,982.3	69,327.2	69,673.9	70,022.3	70,372.4	70,724.2	71,077.8	71,433.2	71,790.4	72,149.4
2. Limestone	3,563.1	3,580.9	3,598.8	3,616.8	3,634.9	3,653.1	3,671.3	3,689.7	3,708.2	3,726.7
3. Ammonia	577.2	580.1	583.0	585.9	588.9	591.8	594.8	597.7	600.7	603.7
4. DEMI water	353.8	353.8	353.8	353.8	353.8	353.8	353.8	353.8	353.8	353.8
5. Technological water	701.6	701.6	701.6	701.6	701.6	701.6	701.6	701.6	701.6	701.6
6. ELKO	420.0	424.2	428.4	432.7	437.1	441.4	445.8	450.3	454.8	459.3
7. Product disposal costs	1,306.4	1,306.4	1,306.4	1,306.4	1,306.4	1,306.4	1,306.4	1,306.4	1,306.4	1,306.4
8. Maintenance	3,300.0	3,300.0	3,300.0	6,600.0	6,600.0	6,600.0	6,600.0	6,600.0	6,600.0	6,600.0
9. Other expenses	5,500.0	5,527.5	5,555.1	5,582.9	5,610.8	5,638.9	5,667.1	5,695.4	5,723.9	5,752.5
10. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5
11. Labour costs	7,100.0	7,171.0	7,242.7	7,315.1	7,388.3	7,462.2	7,536.8	7,612.2	7,688.3	7,765.2
12. Financing costs	41,600.8	39,384.5	36,432.6	33,480.7	30,528.8	27,576.8	25,757.8	23,440.2	21,122.7	18,805.1
13. CO2 emission credits	68,823.8	71,191.0	73,593.1	75,119.7	76,584.0	78,070.6	79,938.4	81,358.0	84,392.9	87,540.9
14. Heat generation costs	-5,639.2	-5,748.2	-5,859.4	-5,972.7	-6,088.1	-6,205.8	-6,325.8	-6,448.1	-6,572.8	-6,699.9
TOTAL all costs	**244,951.5**	**245,570.8**	**245,492.0**	**247,840.4**	**246,829.4**	**245,843.3**	**246,374.1**	**245,961.1**	**247,166.0**	**248,487.1**
TOTAL electricity costs	**239,312.3**	**239,822.5**	**239,632.6**	**241,867.8**	**240,741.2**	**239,637.4**	**240,048.3**	**239,512.9**	**240,593.2**	**241,787.2**
Production (GWh)	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3	3,529.3
Cost price (EUR/MWh)	67.8	68.0	67.9	68.5	68.2	67.9	68.0	67.9	68.2	68.5

	2025	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*
1. Coal	72,510.1	72,872.7	73,237.0	80,442.2	78,318.0	76,170.6	73,999.8	71,805.3	69,587.0	67,344.8
2. Limestone	3,745.3	3,764.1	3,782.9	4,155.0	4,045.3	3,934.4	3,822.3	3,708.9	3,594.3	3,478.5
3. Ammonia	606.7	609.8	612.8	673.1	655.3	637.4	619.2	600.8	582.3	563.5
4. DEMI water	353.8	353.8	353.8	386.7	374.6	362.5	350.4	338.3	326.2	314.2
5. Technological water	701.6	701.6	701.6	766.8	742.8	718.8	694.9	670.9	647.0	623.0
6. ELKO	463.9	468.6	473.3	478.0	482.8	487.6	492.5	497.4	502.4	507.4
7. Product disposal costs	1,306.4	1,306.4	1,306.4	1,427.8	1,383.2	1,338.6	1,293.9	1,249.3	1,204.7	1,160.1
8. Maintenance	6,600.0	6,600.0	6,600.0	7,008.8	6,858.6	6,708.3	6,558.0	6,407.7	6,257.5	6,107.2
9. Other expenses	5,781.3	5,810.2	5,342.8	6,057.7	6,094.4	6,131.6	6,169.6	6,208.4	6,248.0	6,288.6
10. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5
11. Labour costs	7,842.8	7,921.2	7,320.3	8,341.1	8,433.3	8,527.1	8,622.6	8,720.0	8,819.3	8,920.7
12. Financing costs	16,487.5	14,169.9	12,252.6	11,031.7	9,810.8	8,589.9	7,369.0	6,148.1	4,927.1	3,706.2
13. CO2 emission credits	90,806.4	94,193.7	97,707.3	110,769.4	111,310.7	111,738.2	111,992.3	112,113.4	112,091.6	111,916.0
14. Heat generation costs	-6,829.4	-6,961.5	-7,096.1	-8,871.0	-9,042.5	-9,217.3	-9,395.5	-9,577.2	-9,762.4	-9,951.1
TOTAL all costs	**249,928.4**	**251,494.4**	**252,413.2**	**274,260.9**	**271,232.2**	**268,067.5**	**264,707.0**	**261,191.1**	**257,509.9**	**253,652.6**
TOTAL electricity costs	**243,098.9**	**244,532.9**	**245,317.2**	**265,389.9**	**262,189.8**	**258,850.2**	**255,311.4**	**251,614.0**	**247,747.6**	**243,701.5**
Production (GWh)	3,529.3	3,529.3	3,529.3	3,837.9	3,717.9	3,598.0	3,478.1	3,358.1	3,238.2	3,118.3
Cost price (EUR/MWh)	68.9	69.3	69.5	69.2	70.5	71.9	73.4	74.9	76.5	78.2

	2035	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*	*2044*
1. Coal	65,078.3	62,787.6	60,472.3	58,132.3	55,767.4	53,377.3	53,644.2	53,912.4	54,182.0	54,452.9
2. Limestone	3,361.5	3,243.1	3,123.5	3,002.7	2,880.5	2,757.1	2,770.9	2,784.7	2,798.6	2,812.6
3. Ammonia	544.6	525.4	506.0	486.4	466.6	446.6	448.9	451.1	453.4	455.6
4. DEMI water	302.1	290.0	277.9	265.8	253.7	241.7	241.7	241.7	241.7	241.7
5. Technological water	599.0	575.1	551.1	527.1	503.2	479.2	479.2	479.2	479.2	479.2
6. ELKO	512.5	517.6	522.8	528.0	533.3	538.6	544.0	549.4	554.9	560.5
7. Product disposal costs	1,115.5	1,070.8	1,026.2	981.6	937.0	892.4	892.4	892.4	892.4	892.4
8. Maintenance	5,956.9	5,806.6	5,656.4	5,506.1	5,355.8	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9
9. Other expenses	6,330.1	6,372.8	6,416.8	6,462.3	6,509.3	6,230.4	6,261.5	6,292.8	6,324.3	6,355.9
10. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5
11. Labour costs	9,024.3	9,130.4	9,239.2	9,350.9	9,465.9	9,105.3	9,196.3	9,288.3	9,381.2	9,475.0
12. Financing costs	2,485.3	1,264.4	314.4							
13. CO2 emission credits	111,575.4	111,057.8	110,350.8	109,440.9	108,314.3	106,956.3	110,896.0	114,980.8	119,216.1	123,607.4
14. Heat generation costs	-10,143.5	-10,339.6	-10,539.5	-10,743.3	-10,951.0	-11,162.7	-11,378.6	-11,598.6	-11,822.8	-12,051.4
TOTAL all costs	**249,608.0**	**245,364.3**	**241,179.9**	**237,406.7**	**233,709.6**	**230,254.2**	**234,604.5**	**239,102.3**	**243,753.2**	**248,562.7**
TOTAL electricity costs	**239,464.5**	**235,024.7**	**230,640.4**	**226,663.4**	**222,758.6**	**219,091.5**	**223,225.9**	**227,503.8**	**231,930.4**	**236,511.3**
Production (GWh)	2,998.3	2,878.4	2,758.5	2,638.5	2,518.6	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7
Cost price (EUR/MWh)	79.9	81.7	83.6	85.9	88.4	91.3	93.1	94.8	96.7	98.6

	2045	*2046*	*2047*	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
1. Coal	54,725.2	54,998.8	55,273.8	55,550.2	55,827.9	56,107.1	56,387.6	56,669.5	56,952.9	57,237.6
2. Limestone	2,826.7	2,840.8	2,855.0	2,869.3	2,883.7	2,898.1	2,912.6	2,927.1	2,941.8	2,956.5
3. Ammonia	457.9	460.2	462.5	464.8	467.1	469.5	471.8	474.2	476.6	478.9
4. DEMI water	241.7	241.7	241.7	241.7	241.7	241.7	241.7	241.7	241.7	241.7
5. Technological water	479.2	479.2	479.2	479.2	479.2	479.2	479.2	479.2	479.2	479.2
6. ELKO	566.1	571.8	577.5	583.2	589.1	595.0	600.9	606.9	613.0	619.1
7. Product disposal costs	892.4	892.4	892.4	892.4	892.4	892.4	892.4	892.4	892.4	892.4
8. Maintenance	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9
9. Other expenses	6,387.7	6,419.6	6,451.7	6,484.0	6,516.4	6,549.0	6,581.7	6,614.7	6,647.7	6,681.0
10. Depreciation	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2
11. Labour costs	9,569.7	9,665.4	9,762.1	9,859.7	9,958.3	10,057.9	10,158.5	10,260.0	10,362.6	10,466.3
12. Financing costs										
13. CO2 emission credits	128,160.5	132,881.2	137,775.9	142,850.8	148,112.7	153,568.4	159,225.1	165,090.1	171,171.2	177,476.3
14. Heat generation costs	-12,284.4	-12,521.9	-12,764.0	-13,010.8	-13,262.4	-13,518.8	-13,780.1	-14,046.6	-14,318.2	-14,595.0
TOTAL all costs	**212,921.1**	**218,065.2**	**223,385.8**	**228,889.4**	**234,582.6**	**240,472.2**	**246,565.5**	**252,869.9**	**259,393.1**	**266,143.0**
TOTAL electricity costs	**200,636.7**	**205,543.3**	**210,621.8**	**215,878.6**	**221,320.2**	**226,953.4**	**232,785.4**	**238,823.3**	**245,074.9**	**251,548.0**
Production (GWh)	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7	2,398.7
Cost price (EUR/MWh)	83.6	85.7	87.8	90.0	92.3	94.6	97.0	99.6	102.2	104.9

Annex 3: Revenue and expenses of the project (in 000 EUR)

	2015	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*
REVENUE	**271,707.5**	**275,661.9**	**279,619.4**	**283,579.9**	**287,543.7**	**291,510.7**	**297,791.2**	**304,207.6**	**310,763.0**	**317,460.2**
1.El. and th. power sales	266,207.5	270,092.9	273,980.4	277,870.0	281,761.9	285,655.9	291,862.5	298,203.9	304,683.2	311,303.3
2. Ash and gypsum sales	1,500.0	1,529.0	1,558.6	1,588.7	1,619.4	1,650.7	1,682.6	1,715.2	1,748.3	1,782.1
3. Ancillary services	4,000.0	4,040.0	4,080.4	4,121.2	4,162.4	4,204.0	4,246.1	4,288.5	4,331.4	4,374.7
EXPENSES	**244,951.5**	**245,695.5**	**245,492.0**	**247,840.4**	**246,829.4**	**245,843.3**	**246,374.1**	**245,961.1**	**247,166.0**	**248,487.1**
1. Coal	68,982.3	69,327.2	69,673.9	70,022.3	70,372.4	70,724.2	71,077.8	71,433.2	71,790.4	72,149.4
2. Maintenance	3,300.0	3,300.0	3,300.0	6,600.0	6,600.0	6,600.0	6,600.0	6,600.0	6,600.0	6,600.0
3. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5
4. Labour costs	7,100.0	7,171.0	7,242.7	7,315.1	7,388.3	7,462.2	7,536.8	7,612.2	7,688.3	7,765.2
5. Financing costs	41,600.8	39,384.5	36,432.6	33,480.7	30,528.8	27,576.8	25,757.8	23,440.2	21,122.7	18,805.1
6. Other costs	12,422.1	12,599.2	12,527.2	12,580.1	12,633.4	12,686.9	12,740.8	12,794.9	12,849.3	12,904.0
7. CO_2 emission credits	68,823.8	71,191.0	73,593.1	75,119.7	76,584.0	78,070.6	79,938.4	81,358.0	84,392.9	87,540.9
PROFIT/LOSS	**26,756.0**	**29,966.4**	**34,127.3**	**35,739.5**	**40,714.3**	**45,667.4**	**51,417.1**	**58,246.6**	**63,596.9**	**68,973.1**
Income tax	5,351.2	5,993.3	6,825.5	7,147.9	8,142.9	9,133.5	10,283.4	11,649.3	12,719.4	13,794.6
NET PROFIT/LOSS	**21,404.8**	**23,973.1**	**27,301.9**	**28,591.6**	**32,571.4**	**36,533.9**	**41,133.7**	**46,597.3**	**50,877.5**	**55,178.5**

	2025	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*
REVENUE	**324,302.3**	**329,341.4**	**334,459.0**	**369,790.8**	**364,294.7**	**358,539.5**	**353,784.7**	**348,712.5**	**343,312.3**	**337,573.4**
1.El. and th. power sales	318,067.3	323,027.0	328,064.2	363,314.4	357,735.6	351,896.5	347,056.6	341,898.1	336,410.4	330,582.7
2. Ash and gypsum sales	1,816.6	1,851.7	1,887.5	1,924.0	1,961.2	1,999.1	2,037.8	2,077.2	2,117.3	2,158.3
3. Ancillary services	4,418.5	4,462.7	4,507.3	4,552.4	4,597.9	4,643.9	4,690.3	4,737.2	4,784.6	4,832.4
EXPENSES	**249,928.4**	**251,494.4**	**252,413.2**	**274,260.9**	**271,232.2**	**268,067.5**	**264,707.0**	**261,191.1**	**257,509.9**	**253,652.6**
1. Coal	72,510.1	72,872.7	73,237.0	80,442.2	78,318.0	76,170.6	73,999.8	71,805.3	69,587.0	67,344.8
2. Maintenance	6,600.0	6,600.0	6,600.0	7,008.8	6,858.6	6,708.3	6,558.0	6,407.7	6,257.5	6,107.2
3. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5
4. Labour costs	7,842.8	7,921.2	7,320.3	8,341.1	8,433.3	8,527.1	8,622.6	8,720.0	8,819.3	8,920.7
5. Financing costs	16,487.5	14,169.9	12,252.6	11,031.7	9,810.8	8,589.9	7,369.0	6,148.1	4,927.1	3,706.2
6. Other costs	12,959.0	13,014.3	12,573.5	13,945.1	13,778.3	13,610.9	13,442.8	13,274.1	13,104.9	12,935.2
7. CO_2 emission credits	90,806.4	94,193.7	97,707.3	110,769.4	111,310.7	111,738.2	111,992.3	112,113.4	112,091.6	111,916.0
PROFIT/LOSS	**74,374.0**	**77,847.0**	**82,045.7**	**95,529.9**	**93,062.5**	**90,471.9**	**89,077.8**	**87,521.4**	**85,802.4**	**83,920.8**
Income tax	14,874.8	15,569.4	16,409.1	19,106.0	18,612.5	18,094.4	17,815.6	17,504.3	17,160.5	16,784.2
NET PROFIT/LOSS	**59,499.2**	**62,277.6**	**65,636.6**	**76,423.9**	**74,450.0**	**72,377.5**	**71,262.2**	**70,017.1**	**68,641.9**	**67,136.6**

	2035	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*	*2044*
REVENUE	**331,484.6**	**325,034.6**	**318,211.7**	**311,003.9**	**303,398.9**	**295,384.0**	**301,047.1**	**306,819.3**	**312,702.6**	**318,699.1**
1.El. and th. power sales	324,403.8	317,862.5	310,947.0	303,645.2	295,944.8	287,833.2	293,398.2	299,070.9	304,853.2	310,747.3
2. Ash and gypsum sales	2,200.0	2,242.5	2,285.9	2,330.1	2,375.1	2,421.1	2,467.9	2,515.6	2,564.2	2,613.8
3. Ancillary services	4,880.8	4,929.6	4,978.9	5,028.7	5,078.9	5,129.7	5,181.0	5,232.8	5,285.2	5,338.0
EXPENSES	**249,608.0**	**245,364.3**	**241,179.9**	**237,406.7**	**233,709.6**	**230,254.2**	**234,604.5**	**239,102.3**	**243,753.2**	**248,562.7**
1. Coal	65,078.3	62,787.6	60,472.3	58,132.3	55,767.4	53,377.3	53,644.2	53,912.4	54,182.0	54,452.9
2. Maintenance	5,956.9	5,806.6	5,656.4	5,506.1	5,355.8	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9
3. Depreciation	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5	42,722.5
4. Labour costs	9,024.3	9,130.4	9,239.2	9,350.9	9,465.9	9,105.3	9,196.3	9,288.3	9,381.2	9,475.0
5. Financing costs	2,485.3	1,264.4	314.4							
6. Other costs	12,765.2	12,594.9	12,424.4	12,254.0	12,083.7	11,586.0	11,638.5	11,691.4	11,744.5	11,797.9
7. CO_2 emission credits	111,575.4	111,057.8	110,350.8	109,440.9	108,314.3	106,956.3	110,896.0	114,980.8	119,216.1	123,607.4
PROFIT/LOSS	**81,876.6**	**79,670.3**	**77,031.8**	**73,597.3**	**69,689.3**	**65,129.7**	**66,442.7**	**67,717.0**	**68,949.4**	**70,136.5**
Income tax	16,375.3	15,934.1	15,406.4	14,719.5	13,937.9	13,025.9	13,288.5	13,543.4	13,789.9	14,027.3
NET PROFIT/LOSS	**65,501.3**	**63,736.3**	**61,625.5**	**58,877.8**	**55,751.4**	**52,103.8**	**53,154.1**	**54,173.6**	**55,159.5**	**56,109.2**

	2045	*2046*	*2047*	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
REVENUE	**324,811.1**	**331,040.8**	**337,390.4**	**343,862.3**	**350,458.8**	**357,182.3**	**364,035.2**	**371,020.2**	**378,139.6**	**385,396.2**
1.El. and th. power sales	316,755.4	322,879.6	329,122.3	335,485.6	341,972.0	348,583.8	355,323.4	362,193.3	369,196.1	376,334.2
2. Ash and gypsum sales	2,664.3	2,715.9	2,768.4	2,821.9	2,876.4	2,932.1	2,988.8	3,046.5	3,105.4	3,165.5
3. Ancillary services	5,391.4	5,445.3	5,499.8	5,554.8	5,610.3	5,666.4	5,723.1	5,780.3	5,838.1	5,896.5
EXPENSES	**212,921.1**	**218,065.2**	**223,385.8**	**228,889.4**	**234,582.6**	**240,472.2**	**246,565.5**	**252,869.9**	**259,393.1**	**266,143.0**
1. Coal	54,725.2	54,998.8	55,273.8	55,550.2	55,827.9	56,107.1	56,387.6	56,669.5	56,952.9	57,237.6
2. Maintenance	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9	6,506.9
3. Depreciation	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2	2,107.2
4. Labour costs	9,569.7	9,665.4	9,762.1	9,859.7	9,958.3	10,057.9	10,158.5	10,260.0	10,362.6	10,466.3
5. Financing costs										
6. Other costs	11,851.7	11,905.7	11,960.0	12,014.6	12,069.6	12,124.8	12,180.3	12,236.2	12,292.3	12,348.8
7. CO_2 emission credits	128,160.5	132,881.2	137,775.9	142,850.8	148,112.7	153,568.4	159,225.1	165,090.1	171,171.2	177,476.3
PROFIT/LOSS	**111,890.0**	**112,975.6**	**114,004.6**	**114,972.9**	**115,876.2**	**116,710.0**	**117,469.7**	**118,150.3**	**118,746.5**	**119,253.2**
Income tax	22,378.0	22,595.1	22,800.9	22,994.6	23,175.2	23,342.0	23,493.9	23,630.1	23,749.3	23,850.6
NET PROFIT/LOSS	**89,512.0**	**90,380.5**	**91,203.7**	**91,978.3**	**92,701.0**	**93,368.0**	**93,975.8**	**94,520.2**	**94,997.2**	**95,402.6**

Annex 4: Project liquidity (in 000 EUR)

	Realised	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
INFLOW	**287,847.0**	**252,275.2**	**398,824.8**	**201,188.9**	**157,933.7**	**276,384.9**	**275,661.9**	**279,619.4**	**283,579.9**	**287,543.7**	**291,510.7**
1. Sales revenues						271,707.5	275,661.9	279,619.4	283,579.9	287,543.7	291,510.7
2. Sources of funding	287,847.0	252,275.2	398,824.8	201,188.9	157,933.7	4,677.4					
- Equity resources	137,847.0	26,275.2	50,824.8	121,188.9	128,933.7	4,677.4					
- Credit resources	150,000.0	226,000.0	348,000.0	80,000.0	29,000.0						
OUTFLOW	**287,847.0**	**252,275.2**	**398,824.8**	**201,188.9**	**157,933.7**	**228,924.2**	**267,444.8**	**268,173.3**	**270,844.2**	**270,828.1**	**270,832.6**
1. Investment	287,847.0	252,275.2	398,824.8	201,188.9	157,933.7	4,677.4					
2. Operating costs						160,628.2	163,463.7	166,336.9	171,637.2	173,578.1	175,543.9
3. Principal and interest						58,267.4	97,962.9	95,011.0	92,059.0	89,107.1	86,155.2
4. Income tax						5,351.2	6,018.2	6,825.5	7,147.9	8,142.9	9,133.5
NET INFLOW						**47,460.7**	**8,217.1**	**11,446.0**	**12,735.8**	**16,715.6**	**20,678.1**

	2021	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*
INFLOW	**297,791.2**	**304,207.6**	**310,763.0**	**317,460.2**	**324,302.3**	**329,341.4**	**334,459.0**	**369,790.8**	**364,294.7**	**358,539.5**	**353,784.7**
1. Sales revenues	297,791.2	304,207.6	310,763.0	317,460.2	324,302.3	329,341.4	334,459.0	369,790.8	364,294.7	358,539.5	353,784.7
2. Sources of funding											
- Equity resources											
- Credit resources											

OUTFLOW	**255,913.4**	**256,866.2**	**259,141.3**	**261,537.5**	**264,059.0**	**266,319.6**	**251,411.6**	**275,956.0**	**272,433.9**	**268,751.1**	**265,111.7**
1. Investment											
2. Operating costs	177,893.8	179,798.3	183,320.9	186,959.5	190,718.4	194,601.9	197,438.1	220,506.7	218,698.9	216,755.1	214,615.5
3. Principal and interest	67,736.2	65,418.6	63,101.0	60,783.4	58,465.9	56,148.3	37,564.3	36,343.4	35,122.5	33,901.6	32,680.6
4. Income tax	10,283.4	11,649.3	12,719.4	13,794.6	14,874.8	15,569.4	16,409.1	19,106.0	18,612.5	18,094.4	17,815.6
NET INFLOW	**41,877.8**	**47,341.4**	**51,621.7**	**55,922.6**	**60,243.3**	**63,021.8**	**83,047.4**	**93,834.7**	**91,860.8**	**89,788.4**	**88,673.0**

	2032	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*	*2039*	*2040*	*2041*	*2042*	*2043*
INFLOW	**348,712.5**	**343,312.3**	**337,573.4**	**331,484.6**	**325,034.6**	**318,211.7**	**311,003.9**	**303,398.9**	**295,384.0**	**301,047.1**	**306,819.3**	**312,702.6**
1. Sales revenues	348,712.5	343,312.3	337,573.4	331,484.6	325,034.6	318,211.7	311,003.9	303,398.9	295,384.0	301,047.1	306,819.3	312,702.6
2. Sources of funding												
- Equity resources												
- Credit resources												
OUTFLOW	**261,284.6**	**257,259.6**	**253,025.9**	**248,572.5**	**243,887.5**	**232,318.3**	**209,403.6**	**204,924.9**	**200,557.7**	**205,170.5**	**209,923.2**	**214,820.6**
1. Investment												
2. Operating costs	212,320.6	209,860.2	207,223.8	204,400.1	201,377.3	198,143.0	194,684.2	190,987.1	187,531.7	191,881.9	196,379.8	201,030.7
3. Principal and interest	31,459.7	30,238.8	29,017.9	27,797.0	26,576.1	18,768.9						
4. Income tax	17,504.3	17,160.5	16,784.2	16,375.3	15,934.1	15,406.4	14,719.5	13,937.9	13,025.9	13,288.5	13,543.4	13,789.9
NET INFLOW	**87,427.9**	**86,052.8**	**84,547.5**	**82,912.1**	**81,147.1**	**85,893.4**	**101,600.3**	**98,473.9**	**94,826.3**	**95,876.6**	**96,896.1**	**97,882.0**

	2044	*2045*	*2046*	*2047*	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
INFLOW	**318,699.1**	**324,811.1**	**331,040.8**	**337,390.4**	**343,862.3**	**350,458.8**	**357,182.3**	**364,035.2**	**371,020.2**	**378,139.6**	**385,396.2**
1. Sales revenues	318,699.1	324,811.1	331,040.8	337,390.4	343,862.3	350,458.8	357,182.3	364,035.2	371,020.2	378,139.6	385,396.2
2. Sources of funding											
- Equity resources											
- Credit resources											
OUTFLOW	**219,867.4**	**233,191.9**	**238,553.2**	**244,079.6**	**249,776.8**	**255,650.6**	**261,707.1**	**267,952.3**	**274,392.8**	**281,035.2**	**287,886.5**
1. Investment											

2. Operating costs	205,840.1	210,813.9	215,958.1	221,278.7	226,782.2	232,475.4	238,365.1	244,458.4	250,762.8	257,285.9	264,035.8
3. Principal and interest											
4. Income tax	14,027.3	22,378.0	22,595.1	22,800.9	22,994.6	23,175.2	23,342.0	23,493.9	23,630.1	23,749.3	23,850.6
NET INFLOW	**98,831.7**	**91,619.2**	**92,487.6**	**93,310.8**	**94,085.5**	**94,808.1**	**95,475.2**	**96,082.9**	**96,627.4**	**97,104.4**	**97,509.7**

Annex 5: Economic flow of the project (in 000 EUR)

	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Inflow					**271,707.5**	**275,661.9**	**279,619.4**	**283,579.9**	**287,543.7**
- Electric power sales					260,568.3	264,344.7	268,121.0	271,897.4	275,673.7
- Thermal power sales					5,639.2	5,748.2	5,859.4	5,972.7	6,088.1
- Ash and gypsum sales					1,500.0	1,529.0	1,558.6	1,588.7	1,619.4
- Ancillary services					4,000.0	4,040.0	4,080.4	4,121.2	4,162.4
Outflow	**519,412.0**	**368,902.8**	**163,398.4**	**117,806.2**	**170,656.8**	**169,481.9**	**173,162.4**	**178,785.1**	**181,721.0**
- Investment	237,253.5	368,902.8	163,398.4	117,806.2	4,677.4				
- Already realized–investment	282,158.6								
- Operation and maintenance					160,628.2	163,463.7	166,336.9	171,637.2	173,578.1
- Income tax					5,351.2	6,018.2	6,825.5	7,147.9	8,142.9
Net Inflow	**-519,412.0**	**-368,902.8**	**-163,398.4**	**-117,806.2**	**101,050.7**	**106,179.9**	**106,457.0**	**104,794.8**	**105,822.7**

	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*
Inflow	**291,510.7**	**297,791.2**	**304,207.6**	**310,763.0**	**317,460.2**	**324,302.3**	**329,341.4**	**334,459.0**	**369,790.8**
- Electric power sales	279,450.1	285,536.7	291,755.8	298,110.4	304,603.4	311,237.8	316,065.5	320,968.1	354,443.4
- Thermal power sales	6,205.8	6,325.8	6,448.1	6,572.8	6,699.9	6,829.4	6,961.5	7,096.1	8,871.0
- Ash and gypsum sales	1,650.7	1,682.6	1,715.2	1,748.3	1,782.1	1,816.6	1,851.7	1,887.5	1,924.0
- Ancillary services	4,204.0	4,246.1	4,288.5	4,331.4	4,374.7	4,418.5	4,462.7	4,507.3	4,552.4
Outflow	**184,677.4**	**188,177.2**	**191,447.6**	**196,040.3**	**200,754.1**	**205,593.1**	**210,171.3**	**213,847.3**	**239,612.6**
- Investment									
- Operation and maintenance	175,543.9	177,893.8	179,798.3	183,320.9	186,959.5	190,718.4	194,601.9	197,438.1	220,506.7
- Income tax	9,133.5	10,283.4	11,649.3	12,719.4	13,794.6	14,874.8	15,569.4	16,409.1	19,106.0
Net Inflow	**106,833.3**	**109,614.0**	**112,760.0**	**114,722.7**	**116,706.1**	**118,709.2**	**119,170.1**	**120,611.7**	**130,178.1**

	2029	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*
Inflow	**364,294.7**	**358,539.5**	**353,784.7**	**348,712.5**	**343,312.3**	**337,573.4**	**331,484.6**	**325,034.6**	**318,211.7**
- Electric power sales	348,693.1	342,679.1	337,661.1	332,320.9	326,648.1	320,631.6	314,260.3	307,522.9	300,407.4
- Thermal power sales	9,042.5	9,217.3	9,395.5	9,577.2	9,762.4	9,951.1	10,143.5	10,339.6	10,539.5
- Ash and gypsum sales	1,961.2	1,999.1	2,037.8	2,077.2	2,117.3	2,158.3	2,200.0	2,242.5	2,285.9
- Ancillary services	4,597.9	4,643.9	4,690.3	4,737.2	4,784.6	4,832.4	4,880.8	4,929.6	4,978.9
Outflow	**237,311.4**	**234,849.5**	**232,431.0**	**229,824.8**	**227,020.7**	**224,008.0**	**220,775.5**	**217,311.4**	**213,549.4**
- Investment									
- Operation and maintenance	218,698.9	216,755.1	214,615.5	212,320.6	209,860.2	207,223.8	204,400.1	201,377.3	198,143.0
- Income tax	18,612.5	18,094.4	17,815.6	17,504.3	17,160.5	16,784.2	16,375.3	15,934.1	15,406.4
Net Inflow	**126,983.3**	**123,689.9**	**121,353.7**	**118,887.7**	**116,291.6**	**113,565.4**	**110,709.1**	**107,723.2**	**104,662.3**

	2038	*2039*	*2040*	*2041*	*2042*	*2043*	*2044*	*2045*	*2046*
Inflow	**311,003.9**	**303,398.9**	**295,384.0**	**301,047.1**	**306,819.3**	**312,702.6**	**318,699.1**	**324,811.1**	**331,040.8**
- Electric power sales	292,901.9	284,993.8	276,670.4	282,019.7	287,472.3	293,030.4	298,695.9	304,471.0	310,357.7
- Thermal power sales	10,743.3	10,951.0	11,162.7	11,378.6	11,598.6	11,822.8	12,051.4	12,284.4	12,521.9
- Ash and gypsum sales	2,330.1	2,375.1	2,421.1	2,467.9	2,515.6	2,564.2	2,613.8	2,664.3	2,715.9
- Ancillary services	5,028.7	5,078.9	5,129.7	5,181.0	5,232.8	5,285.2	5,338.0	5,391.4	5,445.3
Outflow	**209,403.6**	**204,924.9**	**200,557.7**	**205,170.5**	**209,923.2**	**214,820.6**	**219,867.4**	**233,191.9**	**238,553.2**
- Investment									
- Operation and maintenance	194,684.2	190,987.1	187,531.7	191,881.9	196,379.8	201,030.7	205,840.1	210,813.9	215,958.1
- Income tax	14,719.5	13,937.9	13,025.9	13,288.5	13,543.4	13,789.9	14,027.3	22,378.0	22,595.1
Net Inflow	**101,600.3**	**98,473.9**	**94,826.3**	**95,876.6**	**96,896.1**	**97,882.0**	**98,831.7**	**91,619.2**	**92,487.6**

	2047	*2048*	*2049*	*2050*	*2051*	*2052*	*2053*	*2054*
Inflow	**337,390.4**	**343,862.3**	**350,458.8**	**357,182.3**	**364,035.2**	**371,020.2**	**378,139.6**	**385,396.2**
- Electric power sales	316,358.3	322,474.8	328,709.6	335,065.0	341,543.3	348,146.7	354,877.9	361,739.2
- Thermal power sales	12,764.0	13,010.8	13,262.4	13,518.8	13,780.1	14,046.6	14,318.2	14,595.0
- Ash and gypsum sales	2,768.4	2,821.9	2,876.4	2,932.1	2,988.8	3,046.5	3,105.4	3,165.5
- Ancillary services	5,499.8	5,554.8	5,610.3	5,666.4	5,723.1	5,780.3	5,838.1	5,896.5
Outflow	**244,079.6**	**249,776.8**	**255,650.6**	**261,707.1**	**267,952.3**	**274,392.8**	**281,035.2**	**287,886.5**
- Investment								
- Operation and maintenance	221,278.7	226,782.2	232,475.4	238,365.1	244,458.4	250,762.8	257,285.9	264,035.8
- Income tax	22,800.9	22,994.6	23,175.2	23,342.0	23,493.9	23,630.1	23,749.3	23,850.6
Net Inflow	**93,310.8**	**94,085.5**	**94,808.1**	**95,475.2**	**96,082.9**	**96,627.4**	**97,104.4**	**97,509.7**

Annex 6: Amortization schedule of loans (constant prices, 000 EUR)
EIB LOAN
Tranche 1

	Principal balance	Annual instalment	Principal repayment	Interest	Cost of guarantee
	110,000.0				
2011	110,000.0	3,836.3		2,475.0	1,361.3
2012	110,000.0	5,115.0		3,300.0	1,815.0
2013	110,000.0	5,115.0		3,300.0	1,815.0
2014	110,000.0	5,115.0		3,300.0	1,815.0
2015	110,000.0	5,115.0		3,300.0	1,815.0
2016	104,761.9	9,970.7	5,238.1	3,182.1	1,550.5
2017	99,523.8	9,736.0	5,238.1	3,025.0	1,473.0
2018	94,285.7	9,501.4	5,238.1	2,867.9	1,395.4
2019	89,047.6	9,266.7	5,238.1	2,710.7	1,317.9
2020	83,809.5	9,032.0	5,238.1	2,553.6	1,240.4
2021	78,571.4	9,756.0	5,238.1	3,355.0	1,162.9
2022	73,333.3	9,458.4	5,238.1	3,135.0	1,085.3
2023	68,095.2	9,160.9	5,238.1	2,915.0	1,007.8
2024	62,857.1	8,863.4	5,238.1	2,695.0	930.3
2025	57,619.0	8,565.9	5,238.1	2,475.0	852.8
2026	52,381.0	8,268.3	5,238.1	2,255.0	775.2
2027	47,142.9	7,970.8	5,238.1	2,035.0	697.7
2028	41,904.8	7,673.3	5,238.1	1,815.0	620.2
2029	36,666.7	7,375.8	5,238.1	1,595.0	542.7
2030	31,428.6	7,078.2	5,238.1	1,375.0	465.1
2031	26,190.5	6,780.7	5,238.1	1,155.0	387.6
2032	20,952.4	6,483.2	5,238.1	935.0	310.1
2033	15,714.3	6,185.7	5,238.1	715.0	232.6
2034	10,476.2	5,888.1	5,238.1	495.0	155.0
2035	5,238.1	5,590.6	5,238.1	275.0	77.5
2036	0.0	5,293.1	5,238.1	55.0	0.0
TOTAL		**192,195.5**	**110,000.0**	**57,294.3**	**24,901.3**

Tranche 2:

	Principal balance	Annual instalment	Principal repayment	Interest	Cost of guarantee
	34,000.0				
2011	34,000.0	1,203.0		323.0	880.0
2012	34,000.0	1,564.0		1,292.0	272.0
2013	34,000.0	1,564.0		1,292.0	272.0
2014	34,000.0	1,564.0		1,292.0	272.0
2015	34,000.0	1,564.0		1,292.0	272.0
2016	32,381.0	3,154.7	1,619.0	1,276.6	259.0
2017	30,761.9	3,080.2	1,619.0	1,215.1	246.1
2018	29,142.9	3,005.8	1,619.0	1,153.6	233.1
2019	27,523.8	2,931.3	1,619.0	1,092.0	220.2
2020	25,904.8	2,856.8	1,619.0	1,030.5	207.2
2021	24,285.7	2,782.3	1,619.0	969.0	194.3
2022	22,666.7	2,707.9	1,619.0	907.5	181.3
2023	21,047.6	2,633.4	1,619.0	846.0	168.4
2024	19,428.6	2,558.9	1,619.0	784.4	155.4
2025	17,809.5	2,484.4	1,619.0	722.9	142.5
2026	16,190.5	2,410.0	1,619.0	661.4	129.5
2027	14,571.4	2,335.5	1,619.0	599.9	116.6
2028	12,952.4	2,261.0	1,619.0	538.3	103.6
2029	11,333.3	2,186.5	1,619.0	476.8	90.7
2030	9,714.3	2,112.0	1,619.0	415.3	77.7
2031	8,095.2	2,037.6	1,619.0	353.8	64.8
2032	6,476.2	1,963.1	1,619.0	292.2	51.8
2033	4,857.1	1,888.6	1,619.0	230.7	38.9
2034	3,238.1	1,814.1	1,619.0	169.2	25.9
2035	1,619.0	1,739.7	1,619.0	107.7	13.0
2036	0.0	1,665.2	1,619.0	46.1	0.0
TOTAL		**58,068.0**	**34,000.0**	**19,380.0**	**4,688.0**

Tranche 3:

	Principal balance	Annual instalment	Principal repayment	Interest	Cost of guarantee
	245,000.0				
2012	245,000.0	8,942.5		6,982.5	1,960.0
2013	245,000.0	11,270.0		9,310.0	1,960.0
2014	245,000.0	11,270.0		9,310.0	1,960.0
2015	245,000.0	11,270.0		9,310.0	1,960.0
2016	233,863.6	21,999.9	11,136.4	8,992.6	1,870.9
2017	222,727.3	21,487.6	11,136.4	8,569.4	1,781.8
2018	211,590.9	20,975.3	11,136.4	8,146.3	1,692.7
2019	200,454.5	20,463.1	11,136.4	7,723.1	1,603.6
2020	189,318.2	19,950.8	11,136.4	7,299.9	1,514.5
2021	178,181.8	19,438.5	11,136.4	6,876.7	1,425.5
2022	167,045.5	18,926.3	11,136.4	6,453.5	1,336.4
2023	155,909.1	18,414.0	11,136.4	6,030.3	1,247.3
2024	144,772.7	17,901.7	11,136.4	5,607.2	1,158.2
2025	133,636.4	17,389.4	11,136.4	5,184.0	1,069.1
2026	122,500.0	16,877.2	11,136.4	4,760.8	980.0
2027	111,363.6	16,364.9	11,136.4	4,337.6	890.9
2028	100,227.3	15,852.6	11,136.4	3,914.4	801.8
2029	89,090.9	15,340.3	11,136.4	3,491.3	712.7
2030	77,954.5	14,828.1	11,136.4	3,068.1	623.6
2031	66,818.2	14,315.8	11,136.4	2,644.9	534.5
2032	55,681.8	13,803.5	11,136.4	2,221.7	445.5
2033	44,545.5	13,291.3	11,136.4	1,798.5	356.4
2034	33,409.1	12,779.0	11,136.4	1,375.3	267.3
2035	22,272.7	12,266.7	11,136.4	952.2	178.2
2036	11,136.4	11,754.4	11,136.4	529.0	89.1
2037	0.0	11,242.2	11,136.4	105.8	0.0
TOTAL		**408,415.0**	**245,000.0**	**134,995.0**	**28,420.0**

Tranche 4:

	Principal balance	Annual instalment	Principal repayment	Interest	Cost of guarantee
	161,000.0				
2012	161,000.0	2,817.5		1,529.5	1,288.0
2013	161,000.0	7,406.0		6,118.0	1,288.0
2014	161,000.0	7,406.0		6,118.0	1,288.0
2015	161,000.0	7,406.0		6,118.0	1,288.0
2016	153,681.8	14,596.1	7,318.2	6,048.5	1,229.5
2017	146,363.6	14,259.5	7,318.2	5,770.4	1,170.9
2018	139,045.5	13,922.8	7,318.2	5,492.3	1,112.4
2019	131,727.3	13,586.2	7,318.2	5,214.2	1,053.8
2020	124,409.1	13,249.6	7,318.2	4,936.1	995.3
2021	117,090.9	12,912.9	7,318.2	4,658.0	936.7
2022	109,772.7	12,576.3	7,318.2	4,379.9	878.2
2023	102,454.5	12,239.7	7,318.2	4,101.8	819.6
2024	95,136.4	11,903.0	7,318.2	3,823.8	761.1
2025	87,818.2	11,566.4	7,318.2	3,545.7	702.5
2026	80,500.0	11,229.8	7,318.2	3,267.6	644.0
2027	73,181.8	10,893.1	7,318.2	2,989.5	585.5
2028	65,863.6	10,556.5	7,318.2	2,711.4	526.9
2029	58,545.5	10,219.8	7,318.2	2,433.3	468.4
2030	51,227.3	9,883.2	7,318.2	2,155.2	409.8
2031	43,909.1	9,546.6	7,318.2	1,877.1	351.3
2032	36,590.9	9,209.9	7,318.2	1,599.0	292.7
2033	29,272.7	8,873.3	7,318.2	1,320.9	234.2
2034	21,954.5	8,536.7	7,318.2	1,042.8	175.6
2035	14,636.4	8,200.0	7,318.2	764.7	117.1
2036	7,318.2	7,863.4	7,318.2	486.7	58.5
2037	0.0	7,526.8	7,318.2	208.6	0.0
TOTAL		**268,387.0**	**161,000.0**	**88,711.0**	**18,676.0**

EBRD LOAN
Tranche 1:

	Principal balance	Annual instalment	Principal repayment	Interest
	174,000.0			
2011		7,960.5		7,960.5
2012	174,000.0	10,614.0		10,614.0
2013	174,000.0	10,614.0		10,614.0
2014	174,000.0	10,614.0		10,614.0
2015	159,500.0	25,658.5	14,500.0	11,158.5
2016	145,000.0	24,704.4	14,500.0	10,204.4
2017	130,500.0	23,750.3	14,500.0	9,250.3
2018	116,000.0	22,796.2	14,500.0	8,296.2
2019	101,500.0	21,842.1	14,500.0	7,342.1
2020	87,000.0	20,888.0	14,500.0	6,388.0
2021	72,500.0	19,933.9	14,500.0	5,433.9
2022	58,000.0	18,979.8	14,500.0	4,479.8
2023	43,500.0	18,025.7	14,500.0	3,525.7
2024	29,000.0	17,071.6	14,500.0	2,571.6
2025	14,500.0	16,117.5	14,500.0	1,617.5
2026	0.0	15,163.4	14,500.0	663.4
TOTAL		**284,733.6**	**174,000.0**	**110,733.6**

Tranche 2:

	Principal balance	Annual instalment	Principal repayment	Interest
	26,000.0			
2013	26,000.0	1,189.5		1,189.5
2014	26,000.0	1,586.0		1,586.0
2015	23,833.3	3,767.9	2,166.7	1,601.3
2016	21,666.7	3,625.4	2,166.7	1,458.7
2017	19,500.0	3,482.8	2,166.7	1,316.1
2018	17,333.3	3,340.2	2,166.7	1,173.6
2019	15,166.7	3,197.7	2,166.7	1,031.0
2020	13,000.0	3,055.1	2,166.7	888.4
2021	10,833.3	2,912.5	2,166.7	745.9
2022	8,666.7	2,770.0	2,166.7	603.3
2023	6,500.0	2,627.4	2,166.7	460.7
2024	4,333.3	2,484.8	2,166.7	318.2
2025	2,166.7	2,342.3	2,166.7	175.6
2026	0.0	2,199.7	2,166.7	33.0
TOTAL		**38,581.4**	**26,000.0**	**12,581.4**

HSE GROUP LOAN
Tranche 1:

	Principal balance	Annual instalment	Principal repayment	Interest
	54,000.0			
2013	54,000.0	567.0		567.0
2014	54,000.0	2,268.0		2,268.0
2015	54,000.0	2,268.0		2,268.0
2016	43,200.0	12,954.6	10,800.0	2,154.6
2017	32,400.0	12,501.0	10,800.0	1,701.0
2018	21,600.0	12,047.4	10,800.0	1,247.4
2019	10,800.0	11,593.8	10,800.0	793.8
2020	0.0	11,140.2	10,800.0	340.2
TOTAL		**65,340.0**	**54,000.0**	**11,340.0**

Tranche 2:

	Principal balance	Annual instalment	Principal repayment	Interest
	29,000.0			
2014	29,000.0	304.5		304.5
2015	29,000.0	1,218.0		1,218.0
2016	23,200.0	6,957.1	5,800.0	1,157.1
2017	17,400.0	6,713.5	5,800.0	913.5
2018	11,600.0	6,469.9	5,800.0	669.9
2019	5,800.0	6,226.3	5,800.0	426.3
2020	0.0	5,982.7	5,800.0	182.7
TOTAL		**33,872.0**	**29,000.0**	**4,872.0**

Annex 7: Other investments of ŠTPP (000 EUR)

	2011	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*
Other ŠTPP investments	15,535.0	8,131.5	18,531.5	12,181.5	26,181.5	2,581.5	5,781.5	5,581.5	13,381.5

	2020	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*
Other ŠTPP investments	6,381.5	6,381.5	2,381.5	10,381.5	5,681.5	5,681.5	2,381.5	2,381.5	2,381.5

	2029	*2030*	*2031*	*2032*	*2033*	*2034*	*2035*	*2036*	*2037*	*2038*
Other ŠTPP investments	2,381.5	2,381.5	2,381.5	2,381.5	2,381.5	2,381.5	2,381.5	2,381.5	2,381.5	2,381.5

Other investments of ŠTPP include investments in production reliability of Units 3, 4, 5 and common equipment, investment maintenance (4-year overhaul cycles), retrofitting Unit 5 with a DENOx device, investments in information technology, and small investments in the amount of up to 5 % of depreciation charged.

Annex 8: Cash flow for ŠTPP with the investment (000 EUR)

	2011	2012	2013	2014	2015	2016	2017
Operating profit or loss	**15,565.2**	**40,529.6**	**3,225.0**	**4,111.3**	**43,715.2**	**52,989.7**	**55,748.2**
Depreciation	**33,917.4**	**32,224.8**	**32,926.0**	**34,072.4**	**73,736.4**	**66,475.9**	**65,785.6**
Change in working capital	7,557.1	(5,615.0)	24,350.5	17,445.8	(22,989.1)	(13,869.7)	(16,123.6)
Changes in long-term operating receivables	20.0	20.0	20.0	20.0	20.0	10.0	10.0
Changes in long-term operating liabilities	(6.6)	0.0	0.0	0.0	0.0	0.0	0.0
Changes in miscellaneous revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes	(2,849.7)	(7,933.6)	(564.8)	(789.5)	(400.9)	(2,709.8)	(3,861.6)
Changes in provisions and long-term accrued costs and deferred revenues	(5,257.3)	(5,257.3)	(956.5)	(956.5)	(956.5)	(956.5)	(114.0)
Changes in short-term accrued costs and deferred revenues	(5,792.2)	0.0	0.0	0.0	0.0	0.0	0.0
Cash flows from operation	**43,153.9**	**53,968.5**	**59,000.2**	**53,903.5**	**93,125.1**	**101,939.6**	**101,444.6**
Expenditure from investing activities	(338,685.3)	(406,956.3)	(219,720.4)	(170,115.2)	(30,858.9)	(2,581.5)	(5,781.5)
Cash flows from investing activities	**(338,685.3)**	**(406,956.3)**	**(219,720.4)**	**(170,115.2)**	**(30,858.9)**	**(2,581.5)**	**(5,781.5)**
New financial liabilities	299,000.0	347,700.0	80,000.0	31,500.0	0.0	0.0	0.0
Principal repayments	(10,273.2)	(10,273.2)	(8,330.9)	(1,388.9)	(18,055.6)	(59,967.3)	(59,272.8)
Interest costs	(1,316.6)	(861.5)	(401.0)	(163.8)	(41,710.6)	(39,440.7)	(36,440.4)
Dividends	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital increase	8,171.9	18,922.5	89,452.1	86,264.4	0.0	0.0	0.0
Changes in reserves	(569.9)	(1,586.7)	(113.0)	(157.9)	(80.2)	(542.0)	(772.3)
Cash flows from financing	**295,012.2**	**353,901.1**	**160,607.2**	**116,053.8**	**(59,846.4)**	**(99,950.0)**	**(96,485.5)**
Cash flows for the period	**(317.6)**	**913.3**	**(113.0)**	**(157.9)**	**2,419.8**	**(591.9)**	**(822.3)**
Opening balance of cash flows	**47.6**	**(270.0)**	**643.3**	**530.3**	**372.4**	**2,792.2**	**2,200.3**
Closing balance of cash flows	**(270.0)**	**643.3**	**530.3**	**372.4**	**2,792.2**	**2,200.3**	**1,378.0**
	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Operating profit or loss	**57,005.9**	**63,350.4**	**66,303.3**	**69,580.5**	**80,067.5**	**81,676.2**	**83,245.2**

Depreciation	**65,397.3**	**62,149.1**	**62,086.4**	**61,796.8**	**54,643.6**	**54,285.8**	**53,865.8**
Change in working capital	(20,117.5)	(12,094.9)	(706.4)	(256.1)	(231.5)	(211.1)	(183.0)
Changes in long-term operating receivables	9.9	0.0	0.0	0.0	0.0	0.0	0.0
Changes in long-term operating liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in miscellaneous revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes	(4,705.0)	(6,564.3)	(7,745.3)	(8,764.5)	(11,325.4)	(12,110.7)	(12,888.0)
Changes in provisions and long-term accrued costs and deferred revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in short-term accrued costs and deferred revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash flows from operation	**97,590.6**	**106,840.2**	**119,938.0**	**122,356.7**	**123,154.1**	**123,640.2**	**124,040.0**
Expenditure from investing activities	(5,581.5)	(13,381.5)	(6,381.5)	(6,381.5)	(2,381.5)	(10,381.5)	(5,681.5)
Cash flows from investing activities	**(5,581.5)**	**(13,381.5)**	**(6,381.5)**	**(6,381.5)**	**(2,381.5)**	**(10,381.5)**	**(5,681.5)**
New financial liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Principal repayments	(58,578.4)	(58,578.4)	(58,578.4)	(41,978.4)	(41,978.4)	(41,978.4)	(41,978.4)
Interest costs	(33,480.7)	(30,528.8)	(27,576.8)	(25,757.8)	(23,440.2)	(21,122.7)	(18,805.1)
Dividends	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital increase	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in reserves	(941.0)	(1,312.9)	(1,549.1)	(1,752.9)	(2,265.1)	(2,422.1)	(2,577.6)
Cash flows from financing	**(93,000.1)**	**(90,420.0)**	**(87,704.3)**	**(69,489.1)**	**(67,683.7)**	**(65,523.1)**	**(63,361.0)**
Cash flows for the period	**(991.0)**	**3,038.7**	**25,852.3**	**46,486.1**	**53,089.0**	**47,735.5**	**54,997.4**
Opening balance of cash flows	**1,378.0**	**387.0**	**3,425.7**	**29,278.0**	**75,764.1**	**128,853.1**	**176,588.6**
Closing balance of cash flows	**387.0**	**3,425.7**	**29,278.0**	**75,764.1**	**128,853.1**	**176,588.6**	**231,586.0**

	2025	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Operating profit or loss	**84,083.6**	**83,038.3**	**84,155.9**	**101,556.1**	**99,105.3**	**98,614.9**	**94,044.2**
Depreciation	**53,784.7**	**53,566.2**	**52,005.3**	**47,988.7**	**46,762.5**	**45,825.6**	**45,422.4**
Change in working capital	(52.8)	209.7	237.4	(151.2)	505.8	185.4	743.4

Changes in long-term operating receivables	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in long-term operating liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in miscellaneous revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes	(13,519.2)	(13,773.7)	(14,380.7)	(18,104.9)	(17,858.9)	(18,005.0)	(17,335.0)
Changes in provisions and long-term accrued costs and deferred revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in short-term accrued costs and deferred revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash flows from operation	**124,296.3**	**123,040.5**	**122,018.0**	**131,288.6**	**128,514.7**	**126,620.9**	**122,874.9**
Expenditure from investing activities	(5,681.5)	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)
Cash flows from investing activities	**(5,681.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**
New financial liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Principal repayments	(41,978.4)	(41,978.4)	(25,311.7)	(25,311.7)	(25,311.7)	(25,311.7)	(25,311.7)
Interest costs	(16,487.5)	(14,169.9)	(12,252.6)	(11,031.7)	(9,810.8)	(8,589.9)	(7,369.0)
Dividends	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital increase	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in reserves	(2,703.8)	(2,754.7)	(2,876.1)	(3,621.0)	(3,571.8)	(3,601.0)	(3,467.0)
Cash flows from financing	**(61,169.7)**	**(58,903.0)**	**(40,440.4)**	**(39,964.4)**	**(38,694.2)**	**(37,502.6)**	**(36,147.7)**
Cash flows for the period	**57,445.1**	**61,756.0**	**79,196.0**	**88,942.8**	**87,438.9**	**86,736.9**	**84,345.7**
Opening balance of cash flows	**231,586.0**	**289,031.1**	**350,787.1**	**429,983.1**	**518,925.9**	**606,364.8**	**693,101.7**
Closing balance of cash flows	**289,031.1**	**350,787.1**	**429,983.1**	**518,925.9**	**606,364.8**	**693,101.7**	**777,447.4**

	2032	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
Operating profit or loss	**91,580.8**	**89,386.5**	**87,713.9**	**84,493.6**	**81,115.1**	**77,547.8**	**73,822.2**
Depreciation	**45,122.6**	**44,392.2**	**42,978.8**	**42,951.9**	**42,922.6**	**42,922.6**	**42,922.6**
Change in working capital	431.7	477.3	524.5	573.4	623.9	676.1	730.2
Changes in long-term operating receivables	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in long-term operating liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Changes in miscellaneous revenue	0.0	0.0	1.0	2.0	3.0	4.0	5.0
Taxes	(17,086.6)	(16,891.9)	(16,801.5)	(16,401.6)	(15,970.1)	(15,446.7)	(14,764.4)
Changes in provisions and long-term accrued costs and deferred revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in short-term accrued costs and deferred revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash flows from operation	**120,048.5**	**117,364.1**	**114,416.6**	**111,619.1**	**108,694.5**	**105,703.9**	**102,715.5**
Expenditure from investing activities	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)	(2,381.5)
Cash flows from investing activities	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**	**(2,381.5)**
New financial liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Principal repayments	(25,311.7)	(25,311.7)	(25,311.7)	(25,311.7)	(25,311.7)	(18,454.5)	0.0
Interest costs	(6,148.1)	(4,927.1)	(3,706.2)	(2,485.3)	(1,264.4)	(314.4)	0.0
Dividends	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital increase	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes in reserves	(3,417.3)	(3,378.4)	(3,360.3)	(3,280.3)	(3,194.0)	(3,089.3)	(2,952.9)
Cash flows from financing	**(34,877.1)**	**(33,617.2)**	**(32,378.2)**	**(31,077.3)**	**(29,770.1)**	**(21,858.2)**	**(2,952.9)**
Cash flows for the period	**82,789.9**	**81,365.4**	**79,656.9**	**78,160.3**	**76,542.8**	**81,464.1**	**97,381.1**
Opening balance of cash flows	**777,447.4**	**860,237.4**	**941,602.8**	**1,021,259.7**	**1,099,420.0**	**1,175,962.8**	**1,257,426.9**
Closing balance of cash flows	**860,237.4**	**941,602.8**	**1,021,259.7**	**1,099,420.0**	**1,175,962.8**	**1,257,426.9**	**1,354,808.1**

Annex 9: Alternatives to construction of Unit 6 on the Slovene electricity market

This study presents analysis of possible alternatives to construction of Unit 6. Only the parts with financial implications are translated below.

Annex 9, Section 3.5.6

3.5.6 COMPARISON OF COSTS OF RENEWABLE SOURCES

141: Ideas on replacing electricity production from traditional power plant systems with production from renewable sources often arise in the public, as such production is said not to cause greenhouse gas emissions, uses free fuel, provides employment … This is impossible due to the small size, unreliability and impermanence of renewable sources; if we wish to retain the current reliability of electricity supply, production from renewable sources can only be an auxiliary source of electricity and not an independent source of electric power. Therefore, the desire to replace the production of Unit 6 in Šoštanj has no proper basis in the context of electric power common sense and no basis in an economic calculation. In order to demonstrate this, let us take a look at four examples of replacing 3,500 TWh of production in Unit 6 in Šoštanj:

a. 100 % of energy from photovoltaic power plants,
b. ½ of energy from a 550 MW gas-steam power plant, ½ of energy from photovoltaic power plants,
c. 550 MW coal-fired unit, 550 MW gas-steam power plant for ensuring reliable electricity supply, and photovoltaic power plants with a 20 % share,
d. same as item c above, but without photovoltaic power plants.

142: The examples are only illustrative and simple; none of them represents a sensibly rounded off electric power system or a sensibly rounded off electricity market. They have only been constructed to clearly demonstrate the interdependence between the reliability of electricity supply and the expenses required for reliability.

3.5.6.a PHOTOVOLTAIC POWER PLANTS

143: Due to the natural geographical features of Slovenia, photovoltaic power plants can only operate at full power for around 1,000 hours annually. For an annual production of 3,500 GWh, as much as is produced in Unit 6 ŠTPP, 3,500 MW of photovoltaic power plants would be required. The specific investment cost of photovoltaic power plants has decreased in the last decade, thus we can (generously) estimate it at 4,000 €/kW. For the required 3,500 MW, we would need:

4,000 €/kW x 3,500,000 kW

144: or as much as 14 billion EUR, which is 12 times more than the entire investment in Unit 6 in Šoštanj. We can assume that the annual annuity of the investment loan repayment is approximately 8 %, meaning that the production of the same amount of electricity that can be produced in Unit 6 ŠTPP in photovoltaic power plants would costs us approximately 1,120 million EUR a year or as much as the entire investment in the coal-fired unit! Additionally, the production from photovoltaic power plants would not be available at night and during cloudy of snowy weather, which means that we would be without electricity anyway for at least ¾ of the time! When the weather is sunny, we will produce much more electricity in the 3,500 MW photovoltaic power plants than we can consume. Because electricity cannot be stored, we will have to sell it at any price that anyone is willing to pay for it.

3.5.6.b PHOTOVOLTAIC POWER PLANTS ½ + GAS-STEAM POWER PLANT ½

145: The 550 MW gas-steam power plant has been included in this combination for improved reliability of electricity supply.

146: To produce half of the amount of electricity produced by Unit 6 ŠTPP in photovoltaic power plants, we need, by the same reasoning as in the previous section, 1,750 MW of photovoltaic power plants, for which we need 7 billion EUR. With an 8 % investment loan repayment rate, this amounts to 550 million EUR a year.

147: Let us conservatively project relatively high investment costs of 1,000 €/kW for the 550 MW gas-steam power plant, and get

1,000 €/kW x 550,000 kW

148: total investment costs in the amount of 0.550 billion EUR, which is 44 million EUR of annual investment loan repayment costs with the same 8 % investment loan repayment rate. Costs of fuel must also be taken into account with a gas-steam power plant. To produce 1,750 GWh of electricity, assuming 60 % efficiency in converting primary fuel into electric power, we need:

1,750 GWh / 0.60,

149: which amounts to 10.5 PJ or 300 million m^3 of natural gas, accounting for a 34.3 MJ/m^3 calorific value. If we estimate the price of natural gas at 6 €/GJ,

6 €/GJ x 10,500,000 GJ,

150: this amounts to 63 million EUR of fuel costs a year. The total annual costs of the gas-steam power plant thus amount to

107 million € = 63 million € + 44 million €,

151: while the total annual costs of the combination photovoltaic power plants ½ + gas-steam power plan ½ amount to

667 million € = 107 million € + 560 million €.

152: This value should be compared to the 1,120 million € amount from the previous example with photovoltaic power plants only. The combination of a gas-steam power plant and photovoltaic power plants is therefore substantially more favourable, as it is about 40 % cheaper than the example with photovoltaic power plants only, as well as more reliable, as it also provides us with electricity when there is no sun.

3.5.6.c COAL UNIT + GAS-STEAM POWER PLANT + PHOTOVOLTAIC POWER PLANTS

153: This example has been prepared for high reliability of electricity supply with a concurrent high level of introducing photovoltaic power plants. The base load from the coal unit is the primary production unit. When this unit fails unexpectedly and when it is under regular annual overhaul, we engage the gas-steam power plant. The photovoltaic power plants are included independently of both units, naturally only when the sun is shining, in the range of up to 20 % of replacing the primarily projected production of Unit 6 ŠTPP. This percentage is still very unrealistic, though much smaller than in the example from the previous section 3.5.6.b.

154: Assuming an approximately 5 % unavailability factor EFOR (equivalent force outage factor), we have a production of about 200 GWh to cover unexpected production losses in Unit 6 ŠTPP. Additionally, the overhaul time needs to be covered; let us assume 4 weeks for overhauling, which amounts to approximately 400 GWh. Additional 400 GWh can be attributed to the gas-steam unit due to its greater flexibility in peak operation, hence we can assume a total 1,000 GWh production for the gas-steam power plant. With the same assumptions as in the example from the previous section 3.5.6.b (550 MW gas-steam unit, investment expenses 1,000 €/kW, 60 % efficiency, natural gas price 6 €/GJ), the annual costs of the gas-steam plant amount to a total of 80 million € (36 million € fuel + 44 million € investment).

155: Let us assume an annual production of 20 % of the entire 3,500 GWh for the photovoltaic power plants, amounting to a total of 700 GWh. The photovoltaic plants reduce the coal-fired plants' fuel consumption. In Slovenian conditions, which allow for 1,000 operational hours (full power operation), this means 700 MW of photovoltaic power plants. With the same assumptions as above (specific investment expense 4,000 €/kW and 8 % investment repayment rate), the annual costs of this investment amount to 224 million EUR, fuel costs are obviously non-existent.

156: The coal unit in this illustrative example is therefore left with producing 1,800 GWh of electricity. Let us assume the characteristics of the planned Unit 6 ŠTPP for this example and the next example in section 3.5.6.d. With a 43 % efficiency rate, the primary energy amounts to 15.1 PJ or 1.4 million tons of Velenje lignite with a calorific value of 10.3 MJ/kg, which costs 34 million € at 2.25 €/GJ. The investment value shall be assumed as 1.3 billion EUR, which amounts to 104 million € annually with an 8 % investment repayment rate. The total annual costs of Unit 6 in Šoštanj therefore amount to 138 million €.

157: The total costs of the 550 MW coal-fired unit 1,800 GWh, 550 MW gas-steam power plant 1.000 GWh, and 700 MW photovoltaic power plants 700 GWh amount to

442 million € = 138 million € + 80 million € + 224 million €,

158: which is more than a third less than in the previous example in section 3.5.6.b, with the cost of the photovoltaic plants being dominant.

3.5.6.d COAL-FIRED UNIT + GAS-STEAM POWER PLANT

159: This example is the same as the previous one, but completely without photovoltaic power plants. The 700 GWh produced by the photovoltaic power plants are taken over by the coal-fired unit.

160: The 550 MW coal-fired unit produces 2,500 GWh of electricity in this case, which would cost 47 million € (43 % efficiency, 20.9 PJ primary energy or 2.0 million tons of Velenje lignite with a calorific value of 10.3 MJ/kg at 2.25 €/GJ). The total annual expense of the investment is the same as in the previous example from section 3.5.6.c and amounts to 104 million € per year (investment value 1.3 billion €, 8 % investment repayment rate). Total annual costs of the coal-fired unit therefore amount to 151 million €.

161: The total annual expenses of the 550 MW coal-fired unit 2,500 GWh and the 550 MW gas-steam power plant 1,000 GWh amount to

231 million € = 151 million € + 80 million €,

162: which is an additional 50 % less than in the previous example from section 3.5.6.c. If the total of 3,500 GWh was produced in the coal-fired unit only (without the gas-steam power plant and without photovoltaic power plants), the total annual costs would amount to 170 million €. However, this would be an extreme case, as there would be no reserve and the supply reliability would therefore be significantly worse.

3.5.6.e SUMMARY

163: The previous four sections have presented four alternatives for replacing the 3,500 GWh of production in the new Unit 6 ŠTPP. As stated above, these alternatives are only illustrative, as they do not present a coherent power system.

164: Relatively favourable estimates of expenses were used for photovoltaic power plants, while relatively unfavourable estimates were used for the coal-fired and gas-steam units. Table 1 below gives a short summary of the results obtained.

Table 1: Alternatives for replacing the 3,500 GWh from Unit 6 ŠTPP

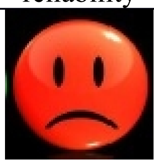
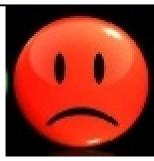
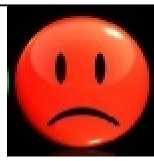
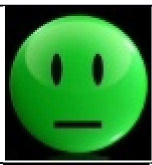
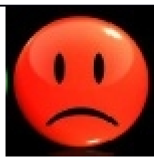
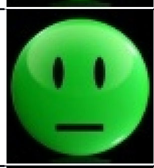
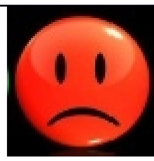
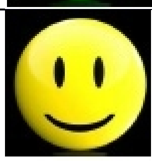
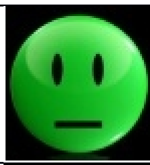
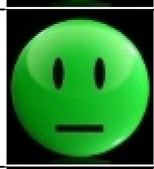
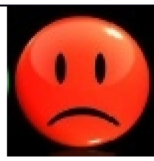
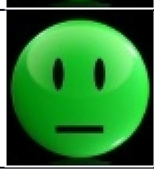
	Coal-fired unit	Gas-steam power plant	Photovoltaic power plants	Percentage of time with guaranteed electricity	Annual expense
(a)			100 %	11 %	1,120 million €
(b)		50 %	50 %	90 %	667 million €
(c)	51 %	29 %	20 %	99 %	442 million €
(d)	71 %	29 %		99 %	231 million €

165: The alternatives were designed to gradually reduce the proportion of photovoltaic energy. Reducing the percentage of photovoltaic energy has brought a great decrease of the projected annual expenses:

- In alternative (a), the projected annual expenses amount to over 1,100 million €/year, despite the fact that electricity is only available 11 % of the time or for a total of 1000 hours per year (photovoltaic power plants can actually operate for more hours per year with power lower than the rated power, but we are stating the value 11 % in the table due to simplicity and also due to the unpredictability of photovoltaic energy).
- In alternative (b), the projected annual costs drop by 40 % to around 700 million €; electricity is unavailable during the annual overhaul and during unforeseen outages of the gas-steam unit, which can be estimated at a total of 10 % of the entire time.
- In alternative (c), the projected annual costs are reduced by 60 % in regard to alternative (a), electricity is only unavailable during a simultaneous unforeseen outage of both units or in case one unit fails while the other is being overhauled. If we assume that the overhaul takes 1 month and if we assume a 5 % EFOR unavailability factor, we can estimate the unavailability at around 1 % of the time (= $0.05^2 + 2 * 0.05 / 12$).
- In alternative (d), the projected annual costs drop by as much as 80 % compared to alternative (a). In comparison with alternative (c), the projected annual costs are halved, while the reliability of the supply of electricity does not change significantly.

166: There is no cost of fuel in photovoltaic power plants; however, a large percentage of photovoltaic power plants brings very high annual expenses, as the investment in photovoltaic plants is exceptionally high. Table 1 reveals another problem of photovoltaic energy: unreliability, as it can only be available for around 1000 hours per year. Table 2 shows, descriptively, additional aspects of all four alternatives.

Table 2: Alternatives for replacing the 3,500 GWh from Unit 6 ŠTPP

	<u>€ investment</u> € annual expenses	Supply reliability	Economics	Environment	Social aspect
(a)	<u>14.00 billion €</u> 1,120 million €				
(b)	<u>7.55 billion €</u> 667 million €				
(c)	<u>4.65 billion €</u> 451 million €				
(d)	<u>1.85 billion €</u> 231 million €				

Legend:  means favourable or good,  means uncertain,  means unfavourable or bad

167: We can observe in Table 2 that the ratio between the total investments in alternatives (a) and (d) is as much as 7.5 (= 14.00 / 1.85), while the ratio between the annual expenses of these two alternatives is only 4.8 (= 1,120 / 231). The reason lies in the fuel costs. While alternative (a) had no fuel costs whatsoever, alternative (d) requires expenses for purchasing coal and natural gas. Despite this fact, the annual operating costs are significantly lower in alternative (d) than in alternative (a).

168: The electricity supply reliability is completely unacceptable in alternative (a), as electricity is unavailable 90 % of the time. Even when the electricity from photovoltaic power plants flows in, it exceeds our needs and it is dependent on cloudiness. The reliability can be corrected slightly by adding a gas-steam unit in alternative (b), and completely corrected only by adding two additional units in alternatives (c) and (d).

169: The economics of alternative (a) are the worst. The economics can only be rectified by reducing the share of the photovoltaic power plants.

170: Environmentally speaking, alternatives (a), (b), (c) and (d) are equal. Coal and gas-steam power plants can only be constructed by complying with very strict environmental legal requirements, making the emission of pollutants as low as it is reasonable to demand. Photovoltaic power plants are also not without an impact on the environment, as we must take into account the entire life cycle of the photovoltaic power plants, including the emissions required for the manufacture of photovoltaic panels.

171: The social aspect of photovoltaic power plants is bad, as we are importing foreign know-how, which we can only assemble in Slovenia, while we must import the entire developmental portion. Photovoltaic power plants therefore only provide employment in less profitable activities, such as assembly, transport etc. It is especially important to emphasize the aspect of the price of electricity produced in photovoltaic power plants, as a high price of electricity can have multiplicatively adverse effects on the quality of life for the population, as well as multiplicatively negative effects on the competitiveness of the domestic economy.