

Modernisation of Cooling Towers in TPP Bitola

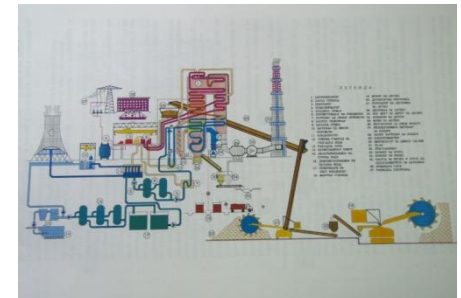
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Content

- ▶ Introduction to Project
- ▶ Project Team
- ▶ Technical findings
- ▶ Technical findings
- ▶ Clean Development Mechanism
- ▶ Emission reduction
- ▶ Total Investment
- ▶ Feasibility of the project
- ▶ Conclusions

Introduction to Project

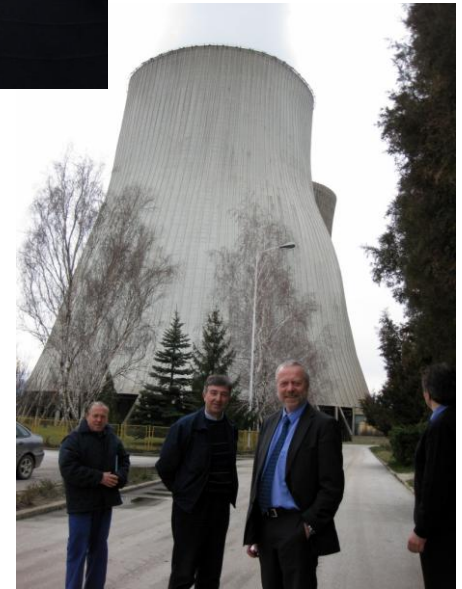
- ▶ To improve the TPP Bitola energy efficiency by installation of a new PVC or PP fill in the cooling towers
- ▶ Aim to reduce cooling water temperature and to decrease the condenser pressure.
- ▶ Since the project is expected to result in energy efficiency improvement and consequent GHG emission reduction, it has a potential for CDM.



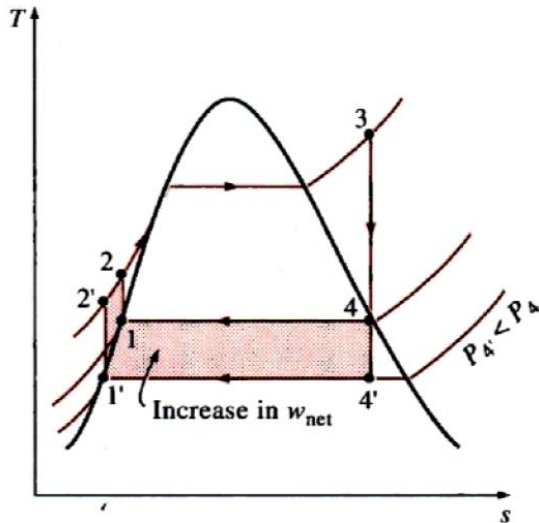
Prefeasibility study on modernisation of Cooling Towers in TPP Bitola, prepared by the Norwegian funded program Cleaner & more cost effective Industry in Macedonia

Project Team

- ▶ REK Bitola representatives
 - Mr Jani Radivchev
 - Ms Daniela Mladenovska
- ▶ Senior Technical Advisors
 - Prof Risto Filkoski
 - Prof Ilja Petrovski
- ▶ Team Leader
 - Igor Mishevski
- ▶ CCEI staff
 - Mr Hans Borchsenius
 - Ms Ann Iren Glimsdal
 - Ms Bojana Stanojevska



Technical findings



- ▶ Realistic approach
- ▶ Condensate pressure decrease from 0.072 bar (condensation temperature 39.5°C) to 0.0645 bar (condensation temperature 37.5°C), temperature drop $\Delta t_{cond} \approx 2^\circ\text{C}$.
- ▶ The cooling temperature drop of 2°C is probably the value level that will be guaranteed by the companies – potential suppliers
- ▶ $\Delta \eta_{PP,abs} (\%) = 0.19 \%$

Technical findings

Parameter	Value
Condensing pressure change, p_{cond} : before / after cooling towers modernisation, bar	0.072 / 0.0645
Dew point change, t_{cond} , °C	39.5 to 37.5
Power plant efficiency change, before/after modernisation, %	30.93 / 31.12
Fuel saving, %	0.62
Fuel saving, t/year	43470
GHG reduction, 1000 tCO ₂ /year	32 -34
Financial effect due to fuel saving	960155 €/year
Financial effect, due to CDM	~ 272000 €/year

Clean Development Mechanism

- ▶ Project is eligible for CDM, and registration should be pursued
- ▶ There is an ongoing CDM project on modernisation of REK Bitola
- ▶ This project should be included in this ongoing initiative to facilitate proper monitoring and verification

Emission reduction

- ▶ The total reduction of CO₂ emission, calculated on a basis of the **fuel consumption**, with the IPCC emission factor for lignite EF=101 t CO₂/TJ on a net calorific value, is **32,050 t CO₂/year**
- ▶ The CO₂ emission reduction, calculated using the **country specific emission factor**, including combustion efficiency of 98 %, is **34,600 t CO₂/year**

Total Investment

Activity	Investment in Euros
Project preparation and project management	330.000
Equipment and installation costs	6.600.000
Waste disposal costs	3.000.000*
Contingency	700.000
Total investment	10.630.000

* To be further analysed

Feasibility of the project

	Without CDM	With CDM
Investment	10.630.000 Eur	10.630.000 Eur
Yearly savings and income from the project	930.000 Eur	1.190.000 Eur
Payback period	11,5 years	9 years
IRR	6,04%	8,15%

Conclusions

- ▶ Overall efficiency of the power plant will improve from **30,93 % to 31,12 %**.
- ▶ Investment approx. **10 mill EUR**, including installation of new filaments and disposal of asbestos
- ▶ Pay-back time: **9–11,5 years**
 - IRR without CDM: **6%**
 - IRR with CDM: **8%**
- ▶ The project should pursue CDM registration