

THE IMPACT OF EUROPEAN ENVIRONMENTAL REGULATION ON CO-GENERATION HEAT AND POWER PLANT

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Pollutant emission corresponding to district heating plants represents one of the main air pollution sources in many localities. Therefore, important investments are needed in this sector so that the negative impact on environment and human health is reduced. 79 from the total of 80 Large Combustion Plants (LCPs) under the co-ordination of Ministry of Interior and Administrative Reform, which belong to 26 public local authorities and are the only providers of thermal energy (heat and hot water) for the population in areas in which they are located are old and they are not in compliance with the requirements of Directive No 2001/80/EC.

Priority 3 of Sectoral Operational Programme "Environment" (SOP ENV) „Improvement of municipal heating systems in selected priority areas” is complementary with the intervention under SOP Competitiveness, regarding the improvement of energy efficiency and sustainable development of the energy sector, especially with the intervention on reducing the negative environmental impact of the energy system functioning.

Taking into the transition periods accepted till the compliance with the Directive 2001/80/CE requests, justified by the necessity to correlate the program of emission reduction with each operators investments programs, trying to not interrupt the heat supply to the households during the cold seasons, to not disturb the internal electricity market and to reduce the social impact of some LCP shut-down, the municipalities where the centralized district heating system represents a viable solution could apply for the necessary funds from the state budget and/or Cohesion fund.

The National Allocation Plan for CO₂ emission, entered into force from 2007, create, both, opportunities and obligations for the co-generation power plant operators. More of them has already been involved in Join Implementation projects.

Keywords: combustion plants, pollutants emission, emission trading.

Abbreviation

BAT - best available technique ;
CHP - cogeneration heat and power;
DH - district heating;
DHS - district heating system;
EU - European Union;
EU ETS –European Union Emission Trading Scheme;
GD - Governmental Decision;

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GHG - greenhouse gases;
JI – Join Implementation;
LCP- large combustion plants
NAP - National Allocation Plans;
PM - particulate matters;
SOP ENV- Sectoral Operational Program “Environment”

1. Introduction

In many urban agglomerations, LCP, particularly the municipal heating plants, are the main pollution sources due to old technologies and long-term under-investments [1] thus are highly polluting the environment and represent a threat to the population health.

During 2003-2006 period Romania transposed the EU legislation within all sectors, including energy and environment, in order to comply with the EU regulation.

The Directive 2001/ 80/EC was transposed into Romanian legislation by the GD 541/2003 concerning the limitation of SO₂, NO_x and PM emissions from LCP, modified and concluded by GD 322/2005.

The legal framework for the implementation of the EU-ETS in Romania was set up by the GD 780/2006 which transposes both, Directive 2003/87/EC and Directive 2004/101/EC. In 2006 Ministry of Environment and Water Management prepared the NAP, establishing the total number of allowances and their allocation for each plant for one year period beginning with 1 January 2007, and for five years period beginning with 1 January 2008.

The paper presents the state of the art of the Directive 2001/80/EC implementation in Romania, with special accent on its effect on DHS, as well as the principles used for NAP development and the influence of the implementation of EU-ETS on thermal power plants.

2. The Implementation of the Directive 2001/80/EC in Romania

After 1989, the industrial output decreased considerably, the electricity and steam demand going down and, consequently, the atmospheric pollutant emission generated by the LCP decreased. On the other hand, the improving of the electrostatic precipitators performances after 1993 generated the continuous decreasing of PM emission.

During the Directive 2001/80/EC transposition process, in Romania, a total of 174 LCPs was inventoried - power plants, CHP plants and thermal plants with a rated thermal power equal or greater than 50 MW, out of which 80 LCPs are under the co-ordination of Ministry of Interior and Administrative Reform, belonging to 26 public local authorities. Those are the only providers of thermal

energy (heat and hot water) for the population in areas in which they are located and some of them are CHP plants. From the total number of Romanian LCP, 7 LCP are in compliance with the requirements of Directive 2001/80/EC, 157 are non-compliant, and 10 LCP are closed. As a result of the analysis of the 174 LCP, Romania obtained transition period on type of pollutants discharged into atmosphere (SO₂, NO_x and PM) between 1-6 years for 77 LCP (2008-2013) and for NO_x, between 1-2 years for 6 LCP (2016-2017)[2].

Table 1 presents the compliance of Romanian LCP to the 2001/80/CE Directive's requests, expressed as thermal installed capacity, as well their evolution during 2003-2015 period[3].

Table 1.

The compliance of Romanian LCP to the 2001/80/CE Directive's requests, expressed as thermal installed capacity

LCP	Installed thermal capacity 2004 (MWt)	Installed thermal capacity 2007 (MWt)	Installed thermal capacity 2015 (MWt)
MEF Coordinator *	33 005	31 423	26 293
MIAR Coordinator**	17 686	17007.6	16 443.8
Others	5 373	5.257	5 087
<i>Total</i>	<i>56 064</i>	<i>53.68.6</i>	<i>47 823.8</i>
Out of which			
complying	1 341	9 053.7	47 823.8
uncomplying	54 723	44 633.9	0

* Ministry of Economy and Finance

** Ministry of Interior and Administrative Reform

Table 2 shows the evolution of pollutants emission during the period 1980-2003 and the targets till 2017[3].

Tabel 2.

The pollutants emission [kt] during 1980-2003 and targets till 2017

Year	SO ₂	NO _x	PM
1980	561	135	189.8
1993	691.9	134.5	128.6
1996	630.5	115.8	86.9
1997	677.7	111.3	71.9
1998	502.5	77.1	68.2
1999	519.8	93.3	56.4
2000	558.9	105.7	53.9
2001	604.1	117.4	48.5
2002	496.7	103.5	35.7
2003	518.1	113.2	30.6
2008	530	125	33,8
2010	336	114	23,2
2013	148	112	15,5
2016		80	
2017		74	

The cost of LCP Directive implementation in the period 2007-2013 is estimated at about €2.1bn Euro.

Priority 3 of SOP ENV „Improvement of municipal heating systems in selected priority areas” supports the refurbishment of the LCP operating within the municipal heating systems with the aim to reduce gas emissions at level of the plant, as well as to improve the energy efficiency at the level of plant and distribution network. This priority axis will be supported by the Cohesion Fund.

SOP ENV mechanism is shown in fig.1 [3].

Actions under SOP ENV envisage reduction of the negative impact on the environment and human health in those urban agglomerations that suffer most from pollution by old urban heating systems.

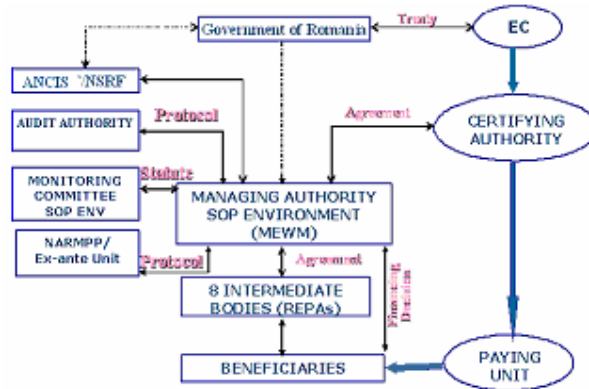


Fig.1. SOP ENV mechanism

Interventions will be based on a medium/long term regional heating strategy. The main aim is to promote the rational use of the non-renewable energy sources and, where possible, those of renewable or less polluting sources of energy for urban heating plants. Particular attention will be given to the LCP upgrading, aiming to significant reduction of SO₂, NO_x and PM emissions, and thus contributing to the implementation of air-related Directives for which Romania has transition periods.

The main measures for achieving these proposed objectives and targets include the BAT implementation specific to LCP for the purposes of desulphurization (DeSO_x), reduction of nitrogen oxides (DeNO_x), and reducing PM emissions from flue gases and undertaking the required monitoring of the relevant pollutants. The co-generation alternative and the use of renewable energy sources, less polluting, will also be supported where the feasibility studies will indicate this solution.

Finally, in line with an integrated approach to environmental protection, projects under this priority axis may also include investment to improve the

management of solid and liquid waste from urban heating plants in relation with the investment in reducing air pollution (notably the rehabilitation of slag and ash dumps).

The selection of projects under this SOP ENV priority axis is based on a national strategy that prioritises interventions against pre-defined set of criteria, where reduction of the negative environmental impact, air pollution in particular, prevails. The beneficiaries of this priority axis will be the local authorities of the selected municipalities or, as the case may be, their wholly owned urban-heating operating companies[3]. It is expected to obtain a reduction of emissions from 80,000 tons SO₂ to 15,000 tons and from 7,000 tons NO_x to 4,000 tons[3].

3. Greenhouse Gas Emissions in Romania

According to 2004 Romania's National Inventory Report for anthropogenic emissions of direct GHG and indirect GHG, the total quantity of emissions (excluding net CO₂ from LULUCF8) is 154.627 mil. tones CO₂ equivalent and the estimate of net emissions after taking into account the removals from the land use change and forestry sector is 119.958 mil. tones CO₂ equivalent. This represents more than 50% below the obligation under the Kyoto Protocol. The restructuring of Romanian economy after 1990 generated a dramatically decreasing of the power demand, which means a reduction of the CO₂ emitted by the fossil fuelled power plants. Fig. 2 shows the total GHG emissions in Romania during the period 1989-2003 compared to the target under the Kyoto Protocol. [3] The GHG emissions evolution reflects the main trend in the economic development of the country. After year 1999 as a result of the revitalization of the economy, the emissions have been increasing.

In the total GHG emissions of year 2004, CO₂ emissions accounts for 75.25%. CH₄ emissions accounts for 17.42% and N₂O for 7% of total GHG emissions. Fluorinated gases contributed with about 0.3% to total GHG emissions.

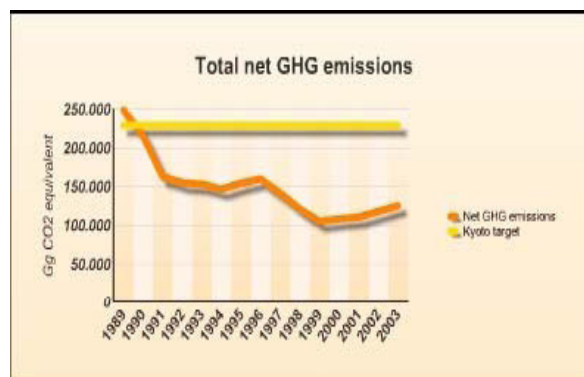


Fig.2 - The total GHG emissions in Romania during the period 1989-2003 compared to the target under the Kyoto Protocol.

4. The Directive 2003/87/CE Transposition in Romania

The EU – ETS is a Community - wide scheme established by Directive 2003/87/EC for trading allowances covering emissions of GHG from installations set out in Annex I of the Directive. The first phase of the scheme started on January 1st 2005 and will end on 31st of December 2007. The second phase will run from 2008 to 2012, corresponding to the first commitment period under the Kyoto Protocol.

The EU ETS is not a mechanism under the Kyoto Protocol, but an instrument under EU climate change policy. The EU ETS is intended to assist the EU member states in achieving their Kyoto Protocol's emission reduction targets in a cost-effective way. It has established an entity-based cap-and-trade system for GHG emissions, starting in the first phase with the CO₂ emitting industrial installations, with a rated thermal input exceeding 20 MW.

The main points of EU ETS are:

- Allocates via NAP – emissions quotas for each installation that generates significant quantities of CO₂ (cement, glass and ceramics, energy, paper, steel);
- Penalties of 100 EUR/t of CO₂ for exceeding the quotas;
- First period 2005-2007 – penalties of 40 EUR/t of CO₂ over the allocated quantity;
- Emission reductions can be done internally in the installation or via emissions trading.

The legal framework for the implementation of the EU ETS in Romania was set up by the GD 780/2006 on Establishing the Greenhouse Gas Emission Trading Scheme, which transpose both Directive 2003/87/EC and Directive 2004/101/EC[4]. In 2006 Romania developed the NAP, which was submitted to the European Commission. The NAP states the total amount of allowances that the Romanian Government intends to issue during the both phases (2007 and 2008 – 2012), and how it intends to distribute these allowances among the installations subject to the scheme.

The NAP becomes operational after its approval by the Romanian Government, following the final decision of the European Commission.

According with the NAP, the national cap is 84,200,000 allowances allocated for the year 2007 and 487,770,000 allowances allocated for the period 2008–2012 (97,554,000 per year)[3].

The total amount of allowances to be allocated was determined through top-down projections. The method used was a combination of the historical approach and forecast approach. The base year for CO₂ emissions projections was the year 2003. Allocation to installations was done in two steps: first, allowances allocated to the sectors, and subsequently to installations within the sectors. The

sectors distinguished are: energy, refineries, production and processing of ferrous metals, cement, lime, glass, ceramics, pulp and paper.

Allocation at sector level was done considering the top-down projected emissions, which are based on historic emissions, projected growth of production and projected reduction of carbon intensity. The historical reference period was 2001– 2004. The relevant emissions of an installation were the average emissions of the two years with the highest emissions within the historic reference period [3].

Allocation of allowances at the installation level was done on the basis of the share of relevant emissions in the total relevant emissions in that sector. For installations which have no historical data for the reference period (including those which began operating in 2005) the relevant emissions was determined using the formula:

Relevant emissions = Average specific emission of the sub sector x forecasted production of the installation for 2007 x 95%.

A CHP bonus was granted to CHP installations with overall efficiency higher than 65%. For 2007 cogeneration reserve includes 912,938, representing 1.08% from the total amount of allowances; for the 2008 – 2012 period, the reserve includes 4,564,690 allowances (912,938 annually), representing 0.94% from the total amount of allowances.

The future decisions of the heat production companies should be influenced by the relationship between the allowances and the current/anticipated emission evolution, as well as by the CO₂ price on the market. As consequence, a company which could sell more electricity and heat that was anticipated has to take into account the number of its allowances within the NAP in order to decide if the best solution is to produce more electricity and heat, but it is necessary to buy allowances, or it is better to produce less, in order to comply with the NAP. In a opposite situation, an other company which could sell less electricity and heat that was anticipated could compensate this loss by selling allowances. Anyway, all the companies has to pay the administrative costs for data collection, emission monitoring, checking and reporting. On the other hand, all of them will have as benefits an improving of their image and reputation due their careful for environment.

There is an increasing of the commercial risk associated with the incertitude of future price of the allowances. The allowances price will be affected by the following factors: the allowances demand on the market, the natural gas price related to coal price, the electricity and heat demand, the climate condition (cool or not so cool winter), economic development or recession. It is expected an increasing of CO₂ price during post Kyoto period.

5. Conclusion

Romania requested and was granted transition periods for the implementation of the Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from LCP, in order to introduce BAT to comply with a maximum permissible level of emissions for SO₂, NO_x and PM. The Directive 2001/ 80/EC was transposed into Romanian legislation by the GD 541/2003 concerning the limitation of SO₂, NO_x and PM emissions from LCP, modified and concluded by GD 322/2005. The technological measures for compliance was included in the emission reduction programs of each operators.

The legal framework for the implementation of the EU ETS in Romania was set up by the GD 780/2006, which transposes Directive 2003/87/EC and Directive 2004/101/EC. In 2006 Romania developed the NAP, which was submitted to the European Commission. The NAP states the total amount of allowances that the Romanian Government intends to issue during 2007 and 2008 – 2012, and how it intends to distribute these allowances among the installations subject to the scheme. The future decisions of the heat production companies should be influenced by the relationship between the allowances and the current/anticipated emission evolution, as well as by the CO₂ price on the market.

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