Report, submitted pursuant to the provisions of Directive 2004/8/EC, concerning evaluation of the promotion of cogeneration in Romania

The general framework for promoting high-efficiency cogeneration in Romania is established by Law No 13/2007 on Energy. In order to ensure market access of electrical energy produced in cogeneration plants, the law makes provision for the National Energy Regulatory Authority [hereinafter referred to as ANRE (Romanian acronym)] to lay down rules on the definition and marketing of electrical energy produced by high-efficiency cogeneration and its priority access to the grid, based on the principle that the security of the national electricity system must not be affected.

Romania transposed Directive 2004/8/EC promoting high-efficiency cogeneration by Government Decision 219/28.02.2007, notified to the Council in April 2007. This Decision lays down the terms and responsibilities for implementing the provisions of the Directive.

I. Background

The combined production of electrical and thermal energy (thermal energy meaning technological steam for industrial consumers, boiling water for heating and hot water for domestic use) has a long tradition in Romania.

Romanian cogeneration plants were developed according to industrial consumers' demand for steam, also supplying heat for urban heating systems.

After 1990, the demand for thermal energy fell sharply because the major industrial consumers disappeared and many urban consumers disconnected themselves from the heating network because they were unsatisfied with the quality of service provided by the centralised supply system. The result was a sharp drop in the amount of electrical energy produced in cogeneration.

Thus, while in 1990 electrical energy produced in cogeneration plants accounted for 40% of total production, in 2007 only 16% of total electricity was still produced in cogeneration plants. Technologically speaking, most plants remained at 1960 – 1970 levels.

In recent years, over 80% of cogeneration has been based on the demand for thermal energy to supply towns and cities with heat. In Romania around five million households are still connected to the centralised heating system.

However, the demand for heating has also dropped: whereas in 1990 there were 251 suppliers in cities with centralised heating systems, in 2007 only 104 remained: 22 cogeneration plant operators and 82 thermal plant operators.

II. Legislative framework

As the demand for thermal energy fell, cogeneration plants had to be made more efficient. This was done by first creating a legislative framework to promote cogeneration.

Thus the following were promoted:

- *National Strategy for supplying thermal energy to localities by means of centralised production and distribution systems*, approved by Government Decision No 882 of 2004;

- *National energy efficiency strategy for 2004 - 2015*, approved by Government Decision No 163 of 2004. Here, upgrading of the sector which supplies heat to localities by means of centralised systems of production and distribution is treated as a measure to increase energy efficiency;
- Government Decision No 462/2006 on the 2006 – 2009 Heating Programme: Quality and Efficiency, amended by *Government Decision No 381/2008*, *2006-2015 Heating Programme, heat and comfort.*

The 2006-2015 Heating Programme finances investment in:
(a) the upgrading of the centralised thermal energy supply system:
1. the unit/units producing the thermal agent;
2. the network for transporting the primary thermal agent (boiling water);
3. the heating points or thermal modules in buildings, where this is economically justified;
(b) thermal upgrading of buildings (internal network in the building, individualised metering and thermostatic regulators, upgrading of insulation of buildings)

The centralised system of production, transport, distribution and supply of thermal energy **must**:
(a) provide the thermal energy required, thus:
1. meet peak demand – using state-of-the- art heat producing equipment.
2. meet demand in the period when urban heating is required – by means of cogeneration plants which can handle variations in thermal consumption of +/- 10% of nominal capacity;
3. meet household hot water demand – by means of cogeneration plants which can handle variations in thermal consumption of +/- 10% of nominal capacity;
(b) the production capacity of the thermal agent production plants will be designed to meet current and expected demand.
(c) the annual energy yield of the thermal agent production units (thermal energy + electrical energy discharged for use)/primary energy resources consumed in order to obtain thermal and electrical energy must be at least 80%; the only exception is production units using biomass as a primary energy resource, where the total energy yield must be at least 70%;

Romania's energy strategy for 2007-2020, approved by Government Decision No 1069/2007, lays down the following short-term objectives for thermal energy:
1. establishment of cogeneration and trigeneration potential - industrial, for heating, agricultural (thermal and refrigeration demand);
2. increasing the efficiency of centralised heating systems and maintaining urban thermal energy consumption on this basis;
3. identifying all local energy and primary resources in the cogeneration area.

Legislation to promote high-efficiency cogeneration:

1. Electrical energy law No 13 / January 2007, which established the framework needed to promote high-efficiency cogeneration. Under the provisions of this law, ANRE lays down rules on the definition and marketing of electrical energy produced in high-efficiency cogeneration plants and priority access to transport and distribution networks, designed to ensure that the security of those networks is not compromised.

2. Government Decision 219/2007 transposing Directive 2004/8/EC on the promotion of high-efficiency cogeneration based on useful energy demand
This regulates:

- Efficiency criteria for cogeneration
- Guarantees of origin for electrical energy produced in high-efficiency cogeneration
- National high-efficiency cogeneration potential
- Support scheme for electrical energy produced in cogeneration based on useful thermal energy demand
- Access to the network.

The Ministry of the Economy and Finance and the Ministry of Administration and Internal Affairs appointed a committee of experts to examine national high-efficiency cogeneration potential. The results are set out in Chapter IV of this Report.

To promote high-efficiency cogeneration and provide a framework for investment and stable development, a bonus-type support scheme is being set up for the production of electrical energy in cogeneration.

2.1. The draft Decision establishing the criteria and conditions for implementing the support scheme promoting high-efficiency cogeneration based on useful thermal energy demand has been prepared and sent to the European Commission. It will be adopted by Government Decision once the Commission has given its opinion.

The draft Decision establishes the legal framework needed to implement a bonus-type support scheme promoting high-efficiency cogeneration based on useful thermal energy demand. This concerns:

- producers of electrical and thermal energy in cogeneration;
- consumers of electrical energy;
- providers of electrical energy;
- network operators;
- the support scheme administrator.

2.2. The regulatory framework needed to implement the support scheme will be drawn up by ANRE within five months of the date of entry into force of the said Decision, and will permit:

- marketing of electrical energy produced in high-efficiency cogeneration on the competitive electrical energy market;
- acquisition of the electrical energy produced in high-efficiency cogeneration, which has not been marketed on the competitive electrical energy market, by regulated contracts;
- promotion of investment in high-efficiency cogeneration plants (with ANRE giving its opinion in advance on new projects or technological upgrading of cogeneration power stations);
- ensuring continuity of thermal energy supply to consumers at reasonable prices.

Support under this scheme will be granted only to producers of electrical and thermal energy in cogeneration who ask ANRE to grant them support for electrical energy produced in high-efficiency cogeneration actually delivered to the electricity grids of the National Energy System.

2.3. The procedure for issuing guarantees of origin for electrical energy produced in high-efficiency cogeneration, drawn up by ANRE, is in the process of being approved by Government Decision.

2.3.1. The procedure for issuing guarantees of origin for electrical energy produced in high-efficiency cogeneration specifies:

- the type of documents required for issuing guarantees of origin for electrical energy produced in high-efficiency cogeneration;
- the conditions for granting guarantees of origin;
- how the information concerning the guarantees of origin should be registered and managed;
- conditions for the recognition, transfer and withdrawal of guarantees of origin.

2.3.2. The guarantees of origin are issued by the competent authority for the purpose of:

- monitoring the exploitation of national higher-efficiency cogeneration potential;
- producing statistics harmonised with statistics produced at European level, based on commonly defined indicators;
- providing access to systems for promoting electrical energy produced in high-efficiency cogeneration, in accordance with the law;
- labelling electrical energy supplied to end users;
- monitoring the implementation of measures concerning high-efficiency cogeneration which form part of the 2007-2010 National Action plan in the field of energy efficiency.

2.3.3. The procedure applies to:

- producers of electrical energy produced in high-efficiency cogeneration;
- network operators who are linked to producers of electrical energy produced in high-efficiency cogeneration.

III. Current situation

As provided for in Article 13(3) of Government Decision No 219/2007 (Article 10(3), ANRE evaluated the electrical and thermal energy output of each cogeneration producer, determined in accordance with the method of calculation set out in Annex II to Directive 2004/8/EC, the cogeneration capacity and fuel used in the cogeneration process, and the quantities of high-efficiency energy and primary fuel savings obtained by cogeneration, determined in accordance with Annex III to Directive 2004/8/EC.

The national data is set out in Table 1. The table also contains information on how electrical and thermal energy produced in cogeneration is used (public / self-consumption) and the mixture of fuel used to produce electrical and thermal energy in cogeneration.

Table 1. Electrical and thermal energy production in cogeneration

	Electrical energy produced in cogeneration (Annex II)	Public	Autoproducers	Share of national production accounted for by cogeneration	Total electrical capacity in cogeneration	Thermal energy produced in cogeneration	Public	Autoproducers	Fuel used for cogeneration (Annex II)	Solid fossil fuel	Oil	Natural gas	Renewables and waste	Other fuels	Fuel saving (Annex III)	
	TWh	%	%	%	GW	PJ	%	%	PJ	%	%	%	%	%	%	PJ
ROMANIA	7.15	87 %	13%	11%	4.43	82.7	85.3%	14.7%	136.2	37.4%	13.1%	48.9%	0.0%	0.6 %	10.3%	15.7

*The Annexes mentioned are Annex II and Annex III of Directive 2004/8/EC

The data concerning the amounts of electrical energy / electricity production capacity used in the cogeneration process as a percentage of the national total, the fuel used in cogeneration power stations, the fuel accepted for cogeneration, the amount of high-efficiency electrical energy, etc. for 2006 are set out in Table 2.

Table 2. Data concerning the percentage of amounts of electrical energy

Total electrical energy produced in Romania	TWh	**62.43**	
Electrical energy produced in cogeneration power stations	TWh	**13.60**	
			21.8%
Electrical energy produced in cogeneration (Annex II)	TWh	**7.15**	
			52.6%
Total electrical capacity	GW	**17.94**	
Total electrical capacity in cogeneration	GW	**4.43**	
Steam condensing turbines with heat recovery	GW	**3.72**	
			84%
Steam backpressure turbines	GW	**0.62**	
			14.1%
Thermal engines	GW	**0.03**	
			0.7%
Gas turbines	GW	**0.06**	
			1.3%
Total fuel used in cogeneration CETs [thermo-electrical power stations]	PJ	**223.9**	
Fuel accepted for cogeneration (Annex II)	PJ	**136.2**	
			60.9%
High-efficiency electrical energy (Annex III)	TWh	**4,7- 5,2**	
% of total cogeneration production		**34,8%- 38,3%**	
% of total efficient cogeneration (Annex II)		**66,2%- 72,7%**	
Electrical energy qualifying for support scheme	TWh	**6.4-7.5**	
Fuel used for cogeneration (Annex III)	PJ	**80,1- 87,6**	
Absolute fuel saving- high-efficiency energy	PJ	**12,1- 15,7**	
Relative fuel saving- high-efficiency energy		**10,3- 13,2%**	
Global production yield		**80,1%- 84,5%**	

* The Annexes mentioned are Annex II and Annex III of Directive 2004/8/EC

This shows that:

- Electrical capacity of cogeneration production units is 4.43GW;
- Steam turbines with adjustable recovery account for the largest proportion of electrical capacity:
    - 84 % units with steam condensing turbines with heat recovery,
    - 14.1% units with steam backpressure turbines,
    - 0.7% units with thermal engines
    - 1.3% units with gas turbines

Energy production in cogeneration plants during the period in question was:

- Electrical energy: 13.7 TWh
- Thermal energy: 22.20 TWh

Regarding the age of cogeneration units:

- The major share of capacity - 53.4% - is in units which are over 30 years old
- A minor share of capacity - 3.5% - is in units less than 10 years old;

The ANRE report shows that the quantity of electrical energy produced in cogeneration, determined in accordance with Annex II to Directive 2004/8/EC, constitutes approximately 11% of total electrical energy produced in Romania, while the total quantity of electrical energy produced in cogeneration plants constitutes 26.2% of total production.

As Romania uses alternative calculation methods, the quantity of high-efficiency electrical energy estimated to qualify for the support scheme is between 6.4 – 7.5 TWh, while the quantity of high-efficiency electrical energy determined in accordance with Annex III to Directive 2004/8/EC is 4.7 – 5.2 TWh. The difference is due to the way of working out the configurations proposed.
(Source: ANRE 2006 Report)

IV. Cogeneration potential

In order to determine the cogeneration potential* for 2010 and 2015 we have taken into consideration the thermal energy production supplied in 2006, which was approximately 22 TWh (technological steam and thermal energy supplied to the public).

Assuming:

- 5% growth in industrial production by 2010 and 20% by 2015;
- A reduction in public consumption of thermal energy of 15% for 2010 and 20% for 2015;
- A reduction in losses from the thermal networks from 25% (current figure) to 22% by 2010 and 20% by 2015;
- Upgrading of existing units or replacement by new units.

Conclusion reached: it is estimated that the total thermal energy produced in high-efficiency cogeneration units will be 12585 TWh in 2010 and 11490 in 2015.

In high-efficiency cogeneration units this thermal energy is equivalent to installed electric power of 1510 MW for 2010 and 1379 MW for 2015.

Taking into account declared investment projects, currently at different stages of study, planning and design, a cogeneration potential of 378 MW from renewable sources (biomass) is envisaged for 2015 (source: “National high-efficiency cogeneration potential" study by OVM-ICCPET).

Taking into account the planned new applications in industry and biomass cogeneration, installed power will be 1770 MW in 2010 and 2030 MW in 2015.

V. Obstacles to the development of cogeneration in Romania

1. The old age of the existing thermal energy production, transport and distribution facilities is a major problem. Local producers of electrical and thermal energy in cogeneration do not have the investment capacity required to upgrade and modernise them.

2. At the same time, the spectacular rise in equipment costs means that correspondingly higher investments are required. Consequently an unrealistically long period of exploitation is required, for any given installed thermal power, in order to make such investments acceptable to investors. In these circumstances, the conventional heat production plants continue to be preferred since they require less capital investment and hence involve less risk.

3. Because of the substantial drop in technological steam consumption resulting from decreased economic activity and industrial restructuring (90% down from 1989 levels), many plants are functioning below their minimum technical limit. In addition, between 2000-2004 many thermal energy consumers stopped using the services of centralised systems and thermal energy demand in the residential sector also fell significantly.

4. There are also typical market obstacles, such as unfavourable natural gas and electrical energy prices. The larger the gap between the price of electricity and that of natural gas the more attractive cogeneration becomes and the more advantageous compared to conventional production. The current situation where gas prices are rising, while electrical energy prices are not, makes it difficult to recover the investment and hence investors are reluctant to invest.

5. The implementation of environmental protection measures is also a major obstacle because it involves extra funds which have to be allocated at the start of investment (especially for coal-powered power stations). Another obstacle to the development of cogeneration is the fact that external costs – such as CO_2 emissions – are not realistically included in energy prices.

6. The transport and distribution of electrical energy may require additional investment to extend grids, in certain areas, which can have a negative impact on the price.

Thus in order for cogeneration to become attractive, it needs to be supported, in particular as regards:

- authorisation procedures,
- procedures for connection to electrical grids,
- placing on the market (insuring the risk that results from the fact that the production of electrical energy depends useful heat demand)
- electrical energy prices.