PROGRESS REPORT

ON

THE COGENERATION OF

ELECTRICITY AND HEAT

IN THE CZECH REPUBLIC

ACCORDING TO DIRECTIVE 2004/8/EC

JUNE 2012

CONTENTS

INTRODUCTION

The European Union has set ambitious targets in its energy and climate policy: to reduce emissions of greenhouse gases by 20 %, to increase the share of renewable sources to 20 % and to make energy savings of 20 %, all by the year 2020. The cogeneration of energy and heat can contribute towards securing energy when fulfilling these goals and consequently plays an important part. The European Union therefore created a specific legal framework to promote and support high-efficiency cogeneration of electricity and heat in the shape of Directive 2004/8/EC[1], which lays down principles, support schemes, guarantees of origin and the obligation of Member States to produce reports, also defining the term "useful heat".

The average efficiency of electricity generation in conventional heat-producing power plants in the European Union is around 40 %[2]. If it were possible to simultaneously use the heat produced, the total efficiency of a facility with cogeneration could almost double.

Cogeneration is highly efficient technology that is able to ensure energy savings. Cogeneration facilities must be located close to the end users so that losses from transmission and distribution are low. There are a number of energy sources – coal, natural gas and renewable energy sources. Although there is greater interest in remote cooling, the use of heat from cogeneration facilities is seldom the preferred option.

The main aim of this Report is to inform the public of the current situation involving cogeneration[3] in the Czech Republic and to present possible onward development. This also fulfils the obligation we have to publish a report according to the above-mentioned Directive, a report on cogeneration, possibilities in the area of cogeneration and the progress achieved when using these possibilities.

The fundamental sources of energy in the Czech Republic are national sources. Their stocks, however, are gradually declining and available stocks will run out relatively soon (especially coal). To make sure the switch to other sources is smooth, existing sources (stocks of coal) must be used as efficiently as possible and in as environmentally-friendly a way as possible; meaning with high efficiency. In cogeneration units.

[1] Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market; also known as the Cogeneration Directive

[2] Unless specified otherwise, the data used in this document is taken from Eurostat.

[3] Cogeneration of electricity and heat.

I. TRANSPOSITION OF THE LEGAL TEXT OF DIRECTIVE 2004/8/EC

The Report is published according to Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC (hereinafter referred to as "Directive 2004/8/EC").

Directive No. 2004/8/EC was adopted with the aim of increasing energy efficiency and improving the safeguarding of energy supplies for EU countries.

This Report follows on from a previous report from 2007 and has been compiled based on legislative steps that themselves follow on from the above-mentioned EU directive. These are aimed at the further promotion of high-efficiency "cogeneration of electricity and heat" (hereinafter referred to as "cogeneration") in the Czech Republic.

The Report has been submitted to the European Commission according to Article 6(3) and according to Article 10(2) of Directive 2004/8/EC must be made public. Member States submit a Progress Report on cogeneration every four years and predict the relevant statistics.

A. THE CURRENT SITUATION IN COGENERATION IN THE CZECH REPUBLIC

The initial situation in the Czech Republic in terms of the use and development of cogeneration is good overall. It can be characterised by the following attributes:

• Sources of cogeneration and the centralised supply of heat have long traditions in the Czech Republic.
The application of condensation extraction and back-pressure steam turbines in particular was supported and developed even during the era of central planning.

• Modern technology is available, the network of financial services works and there is enough operating experience and know-how for the preparation and implementation of new cogeneration projects.

• Support for cogeneration is embedded in Act No. 458/2000 Sb. (since amendment no. 670/2004 Sb.) on business conditions and public administration in the energy sectors and amending certain acts (the Energy Act). This act implements Directive 2004/8/EC.

• Support for cogeneration is also embedded in Act No. 406/2000 Sb. on energy management.

• Support for cogeneration is declared in the State Energy Concept – SEC) and in the State Environmental Policy (SEF).

• Procedure in awarding certificates of origin for electricity from cogeneration is set out in law, as is the method of determining the amount of electricity from the cogeneration of electricity and heat; the original Decree of the Ministry of Industry and Trade No. 439/2005 Sb. was replaced by Decree No. 344/2009 Sb. laying down details of the method of determining electricity from high-efficiency cogeneration of electricity and heat based on a useful heat demand and the determination of electricity from secondary energy sources.

• A system of support for the purchase of electricity from cogeneration through price regulation is in place, implemented by the Energy Regulatory Office based on the energy-related legislation in force.

• Cogeneration investment support projects, however, appear in grant programmes at the CzechInvest agency and the State Environmental Fund (SEF) only to a limited extent.

B. PROGRESS ACHIEVED IN LAW

The history of support for the cogeneration of heat and electricity

Attention has been paid in the Czech Republic to support for the cogeneration of heat and electricity. The first law to regulate the terms and conditions of undertaking business in the energy sectors in the Czech Republic, Act No. 222/1994 Sb., saw support for the cogeneration of electricity regulated in the following way in its Section 18:

"The purchase of electricity:
(1) The supplier is obliged, if technically possible, to buy electricity:
a) from the cogeneration of heat and electricity to an extent corresponding to the technological need of the generation of heat;
b) generated from renewable and secondary energy sources.
(2) The costs associated with the connection of a source according to paragraph (1) are paid by the owner of this facility.
(3) The way of connecting a source according to paragraph (1) to a distributing facility is determined by the supplier.
(4) The price of purchased electricity in accordance with paragraph (1) is determined by price regulations."

As stated in the Progress Report on Cogeneration in the Czech Republic from 2007, Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC was fully transposed in the national law of the Czech Republic in Section 32 of Act No. 458/2000 Sb. of 28 November 2000 on business conditions and public administration in the energy sectors and amending certain acts (the Energy Act), as amended, and by Decree No. 344/2009 Sb. of 30 September 2009 laying down details of the method of determining electricity from high-efficiency cogeneration of electricity and heat based on a useful heat demand and the determination of electricity from secondary energy sources.

Act No. 165/2012 Sb. on promoted energy sources, which introduces a new system of support for renewable energy sources and which integrates support for the cogeneration of electricity and heat, will enter into effect on 1.1.2013. For this reason it will be necessary to also publish a new, related implementing regulation to concern the cogeneration of electricity and heat to replace the above-mentioned Decree No. 344/2009 Sb. The implementing decree is prepared in such a way as to enter into effect on the same date as the Act on Promoted Energy Sources so that the same level of transposition of the directive is maintained for the entire duration.

Situation to the end of 2012

In respect of the fact that directives on opening up the electricity and gas market practically ruled out the possibility of compulsory purchase by electricity distributors, support for cogeneration was expressed in Section 32 of the amendment to Act No. 458/2000 Sb. as follows:

"Cogeneration of electricity and heat and generation of electricity from secondary energy sources

(1) Generators operating a facility for the cogeneration of electricity and heat or a facility for the generation of electricity from secondary energy sources have the right, if they request it and if technical conditions allow, of preferential provision of electricity transport via the transmission system and distribution systems, with the exception of allocation of capacity of international transmission or distribution connecting lines. Further, they have the right of preferential connection of their generating facility to the transmission or distribution system if they request it and if they meet the conditions of connection.

(2) Electricity from high-efficiency cogeneration of electricity and heat is considered electricity

a) which is generated in a joint process together with the supply of useful heat;

b) which is generated at a plant for which the Ministry awarded a certificate of origin for electricity from the cogeneration of electricity and heat;

c) in the generation of which average savings of at least 10 % are made on the input fuel required for the generation of this electricity, evaluated monthly; this requirement only relates to a source with installed electric power of higher than 1 MW, and;

d) which complies with the requirements of minimum efficiency of energy use evaluated monthly[6)].

(3) Electricity generators are entitled to a contribution to the price of electricity from high efficiency cogeneration of electricity and heat. Electricity generators that put into operation a new facility for the high-efficiency cogeneration of electricity and heat are entitled to a contribution to the price of electricity from high-efficiency cogeneration of electricity and heat for a period of at least 6 years from the date of putting the facility into operation. Putting a facility into operation is also considered the updating or reconstruction of the technological part of an existing facility, increasing its technical, operational, safety and environmental standard to a standard which is comparable with a newly-built facility for high-efficiency cogeneration of electricity and heat.

(4) A certificate of origin for electricity from cogeneration of electricity and heat or secondary energy sources (hereinafter referred to as a "certificate") shall be awarded by the Ministry based on an application. Where the information stated in the application does not concur with fact, the Ministry shall not award a certificate or, where a certificate has already been awarded, shall cancel its validity.

(5) A generator of electricity from cogeneration of electricity and heat or from secondary energy sources is obliged

a) to document an application for a contribution to the price of electricity lodged by an operator according to Section 24 (10) (w) or Section 25 (13) by meeting the criteria according to paragraph (2) and with a certificate;

b) to evaluate the quantity of electricity according to the values actually measured.

(6) The quantity of electricity from high-efficiency cogeneration of electricity and heat and electricity from secondary energy sources is kept on record by the Ministry.

(7) A facility for the cogeneration of electricity and heat with installed electricity output of up to 10 MW may allow for separate electricity generation for a certain part of the year.".

It ensues from this provision of the Energy Act that there is no direct state support of cogeneration, but that the legislation in force allows for support for cogeneration within a system of price regulation as undertaken by the Energy Regulatory Office. Direct state support is dealt with to a negligible extent in a state programme, announced annually, in

support of energy savings through a certain contribution towards investment in the construction of new sources of cogeneration and support of consultancy.

Support for the development of electricity generation from cogeneration is also legislatively expressed in paragraph (7) of Act No. 406/2000 Sb. as follows:

*"**Cogeneration of electricity and heat***

(1) Each heat generator with a source having an aggregate output in excess of 5 MWt shall, in building new sources or when changing completed buildings for already built sources, subject the building documentation to an energy audit in terms of the introduction of electricity generation.

(2) Each generator of electricity from heat processes with a source having an aggregate output in excess of 10 MWe shall, in building new sources or when changing completed buildings for already built sources, subject the building documentation to an energy audit in terms of the introduction of the supply of heat. When gas turbines are used, this obligation shall apply to an output in excess of 2 MWe and when combustion engines are used, it shall apply to an output in excess of 0.8 MWe.

(3) *Should a generator specified in paragraphs (1) and (2) decide to implement combined electricity and heat generation, it shall comply with the rules for the design of the facility and for the efficiency of energy use.*

(4) Details for the preparation and execution of combined electricity and heat generation shall be set by way of regulation."

All implementing measures are contained within Decree No. 344/2009 Sb. laying down details of the method of determining electricity from high-efficiency cogeneration of electricity and heat based on a useful heat demand and the determination of electricity from secondary energy sources. Decree No. 344/2009 Sb. fully reflects both Directive 2004/8/EC and Decision of the European Commission of 19 November 2008. Procedure in making calculations of PES criteria complies with the specified procedures according to the EC.

Support for the cogeneration of heat and electricity in the future

Support for high efficiency cogeneration is to be newly regulated from 1 January 2013 by new Act No. 165/2012 Sb. on promoted energy sources. The above-mentioned principles, however, shall remain. Entitlement to preferential connection to the transmission and distribution network for the purpose of electricity transmission shall also remain.

Support for the development of electricity generation from cogeneration shall also be expressed in Section (6) of Act No. 165/2012 Sb. on promoted energy sources as follows:

"*Support for electricity from high-efficiency cogeneration of electricity and heat*

(1) For the purposes of determining support for electricity from high-efficiency cogeneration of electricity and heat according to this Act, electricity from high-efficiency cogeneration of electricity and heat is considered electricity generated in a joint process together with the supply of useful heat in facilities for which the Ministry has awarded a certificate of origin for electricity from high-efficiency cogeneration of electricity and heat, in the generation of which relative savings are made in the input primary fuel required for the generation of this electricity and heat of a minimum of 10 % as opposed to the separate

generation of electricity and heat, whereby the requirement of achieving relative savings of input primary fuel only relate to electricity generated at an electricity generating plant with installed electric power of higher than 1 MW.

(2) Support for electricity from high-efficiency cogeneration of electricity and heat relates to electricity from high-efficiency cogeneration of electricity and heat generated at electricity generating plants within the territory of the Czech Republic connected to the grid system of the Czech Republic either directly or through a supply point or through another electricity generating plant connected to the grid of the Czech Republic.

(3) Support for electricity from the high-efficiency cogeneration of electricity and heat is provided to the amount of electricity reported by the generator within the terms, to the extent and in the manner laid down in implementing regulation.

(4) Support for electricity from high-efficiency cogeneration of electricity and heat does not relate to electricity from high-efficiency cogeneration of electricity and heat in the case of unauthorised supplies of electricity to the grid according to other law.

(5) The Office determines the scope and size of support for electricity from high-efficiency cogeneration of electricity and heat according to this Act in a pricing decision."

The new legislation also includes an amendment to Act No. 406/2000 Sb., which is prior to approval by the Parliament of the Czech Republic. This comprises the omission of the existing Section 7 and the addition of a new Section 9a, whose wording has been proposed as follows:

"Energy review

(1) The builder, building owner or condominium association or energy management association or an operator authorised by it in writing shall ensure an energy review for

b) consideration of the feasibility of introducing the generation of electricity in energy management with total thermal power of higher than 5 MW if building documentation is submitted according to special legal regulation for building a new energy source or for a change to completed buildings for sources of energy already built;

c) consideration of the feasibility of introducing heat supply in energy management with total electrical power of higher than 10 MW if building documentation is submitted according to special legal regulation for building a new energy source or for a change to completed buildings for sources of energy already built; in energy management which uses gas turbines, this obligation relates to total electrical power of higher than 2 MW, for combustion engines this obligation relates to total electrical power of higher than 0.8 MW;

d) consideration of the feasibility of projects to concern the reduction of the energy performance of buildings, increasing the efficiency of energy, reducing emissions from combustion sources of pollution or using renewable or secondary sources or cogeneration of electricity and heat financed by support schemes from national or European finances or finances coming from the sale of greenhouse gas emission permits.

(2) The builder, building owner or condominium association or energy management association may, at its own discretion, also ensure an energy review for

c) source materials for public contracts in the area of increasing energy efficiency, reducing emissions from combustion sources of pollution or using renewable or secondary sources or the cogeneration of electricity and heat."

Conclusion:

The Czech Republic applies support for cogeneration in the form of a bonus for electricity from high-efficiency cogeneration of electricity and heat.

There is no direct state aid for cogeneration, but the legislation in force assumes support within the system of price regulation conducted by the Energy Regulatory Authority in the form of a price decision, which invariably lays down the level of support for the following calendar year. No long-term guarantee of the level of support is laid down and in this sense the support scheme does not therefore provide stable long-term investment conditions. The support scheme is universal and is not targeted to a specific sector.

It ensues from the specified legislative development that the legislation in the Czech Republic relating to cogeneration is currently in full compliance with the aims of Directive 2004/8/EC and contributes significantly towards the possibility of making savings on primary fuel and reducing the load on the environment.

C. PROGRESS ACHIEVED IN STATISTICS

There are currently sufficient source materials for a statistical appraisal of the development of the quantity of electricity from cogeneration based on the requirements laid down by Directive 2004/8/EC "on the promotion of cogeneration based on a useful heat demand in the internal energy market" since the timescale from its entry into force is sufficient for comparison. It is evident that there has been a significant reduction in the use of useful heat in the heat industry, for the welcome reasons of rationalising production, distribution and in particular heat use. The potential for heat savings on the consumption side has not yet been exhausted and the decreasing trend is slowing down.

The following graphs present development in this area between 2005 and 2010:

Generation of electricity from cogeneration (TWh)

Source: Ministry of Industry and Trade

Share of electricity from cogeneration (%)

2005 2006 2007 2008 2009 2010

Source: Ministry of Industry and Trade

Generation of heat from cogeneration (TWh)

Enterprise generators
Public generators

2005 2006 2007 2008 2009 2010

Source: Ministry of Industry and Trade

Problems with calculating cogeneration from biomass

The energy use of biomass is financially supported by Decree of the Energy Regulatory Office No. 502/2005 Sb. on determining the method of computing the amount of electricity generated during joint combustion of biomass and non-renewable sources. According to this method, undertakings may in certain cases calculate that no useful heat is produced when jointly combusting biomass and coal, but that all biomass is used only for the generation of electricity.

From a physical perspective, it should often be a matter of cogeneration in such cases, but this calculation means that only the separate generation of electricity from biomass is considered. It can therefore be assumed that the calculated production of cogeneration electricity from biomass is considerably undervalued in contrast with reality. Given that biomass is burned together with coal in most cases, it is not even possible to accurately present in a table the number of cogeneration facilities and their installed power. Coal has the main energy share and for this reason facilities are only calculated for this. The year 2010 is presented for an illustrative comparison of the share of individual fuels in cogeneration:

Share of fuels in cogeneration in 2010

Brown coal 54 %
Renewable sources 2 %
Oil and oil products 2 %
Biomass 5 %
Biogas and stored gas 2 %
Waste 1 %
Other fuels 5 %
Natural gas 7%
Black coal 22 %

Source: Ministry of Industry and Trade

Conclusion:
The timescale between applying the principles of Directive 2004/8/EC and due statistical monitoring allowed us to obtain comprehensive information to date. We can see continual interest in the generation of electricity through cogeneration in the Czech Republic. This situation is also confirmed by partial statistics from the Energy Regulatory Office.

D. PROGRESS IN AREAS NOT YET STATED

Timescale for implementing measures according to transposition instructions from 2008

All implementing measures are contained within Decree No. 344/2009 Sb. laying down details of the method of determining electricity from high-efficiency cogeneration of electricity and heat based on a useful heat demand and the determination of electricity from secondary energy sources. Decree No. 344/2009 Sb. fully reflects both Directive 2004/8/EC and Decision of the European Commission of 19 November 2008. Procedure in making calculations of PES criteria complies with the specified procedures according to the EC.

Degree of transposition of the directive

Directive 2004/8/EC of the European Parliament and of the Council on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC has been fully transposed in national legislation in the Czech Republic.

Alternative calculation method

The Czech Republic allows operators to use the alternative calculation method according to Article 12(2).A new implementing regulation is currently under preparation and no decision has yet been taken on using the alternative calculation method according to Article 12(2). We calculate mechanical energy, but convert it into an electrical equivalent.

The need to reassess threshold values

No reason was found to re-evaluate the threshold values used to calculate electrical energy from the cogeneration of heat and electricity according to Article 13.

II. NATIONAL POTENTIAL TO INCREASE THE SHARE OF HIGH-EFFICIENCY COGENERATION OF HEAT AND ELECTRICITY

A. PROGRESS ACHIEVED IN RELATION TO A CHANGE OF LEGISLATION AND SUPPORT SCHEME

Cogeneration based on gas engines has seen significant development in the Czech Republic. By contrast, there has been stagnation-to-decline in steam turbine generator sets with regard to the reduction in demand for useful heat as a result of austerity measures. There was a lack of power electricity after the Second World War and for this reason most construction of new sources proceeded in the form of cogeneration.

B. EVALUATION OF PROGRESS

Progress towards increasing the share of high-efficiency cogeneration of heat and electricity in the Czech Republic draws on specific figures, which can be found in the appended tables (see annexes to this Report).

Tables EU-1 and EU-2 on the cogeneration of electricity and heat are part of annual questionnaire “IEA - Eurostat – UNECE” on electricity and heat.

A review of data for 2009 was conducted by the EU in 2010 and the recommendation made, based on the most recently adopted Directive, for the input fuel in the cogeneration of electricity and heat to relate only to the part of electricity and heat generation which is evaluated as "combined production” and not to the entire unfinished generation of electricity and heat in a cogeneration unit, as was the case until now.

The data for 2009 was modified in this spirit based on this requirement and the data for 2010 was processed using a similar methodology. Modification for previous years was not required.

III. BARRIERS TO HIGH-EFFICIENCY COGENERATION OF HEAT AND ELECTRICITY

Drawn-out permit processes for the construction of energy-related facilities are a general problem. This problem should be eased by an amendment to the Building Act that is currently under consideration at the Parliament of the Czech Republic.

Another problem is the reservation of connection capacity by projects that are not implemented in the sphere of renewable energy sources, in particular photovoltaic power plants, which block grid capacity for other electricity generators, including those that cogenerate electricity and heat. This problem should be solved by a new act on promoted energy sources, which, under certain conditions, cancels the reservation of energy input for photovoltaic power plants obtained before 1 April 2010 on the date of promulgation of the act in the Collection of Laws.

The emissions trading system is economically unfavourable for cogeneration facilities with heat input of over 20 MW, which from 1.1.2013 will be forced to buy a progressively rising percentage of permits for carbon dioxide emissions in auctions. These costs are projected in the prices of heat from cogeneration and disadvantage it in competition with local or individual heat production, which is not encumbered by this external factor. In respect of the fact that the use of cogeneration in local and individual heat production is minimal, the disadvantage to larger facilities is a significant barrier to the development of cogeneration of electricity and heat in the Czech Republic. The Government of the Czech Republic has approved a so-called carbon tax as of 1.1.2014; this should remove this disadvantage.

The following barriers can be specified in general:

- Unclear long-term prospects in the area of state aid;
- A complex legal framework;
- Complex and time-consuming administrative procedures;
- The influences of other legislation;
- The availability of connection to the grid (financial, time-related);
- The updating of the grid in order that electricity generated by way of cogeneration may be supplied;
- Unfavourable conditions for reserve supplies of electricity from the grid;
- Delayed submission of reports on cogeneration.

Conclusion:

We can say that procedural steps have been transposed with great success in the Czech Republic as a result of long-term support of cogeneration.

IV. GUARANTEES OF ORIGIN AND SUPPORT SCHEMES

The guarantee of origin is one instrument used by Directive 2004/8/EC. As in the renewable energy sources sector, the certificate of origin was created in order that transparent information is ensured for electricity users on where their electricity comes from and so that generators are able to prove that they sell electricity that comes from cogeneration.

A. ISSUING GUARANTEES OF ORIGIN

The Ministry of Industry and Trade issues certificates of origin relating to cogeneration based on Act No. 165/2012 Sb. on promoted energy sources (according to Section 47), whereby the application forms are published on the Ministry of Industry and Trade website.
Records of the certificates issued are kept by the Ministry of Industry and Trade separately.

B. SUPPORT SCHEMES

The Czech Republic supports cogeneration of electricity and heat in the form of a bonus for electricity from high-efficiency cogeneration of electricity and heat.

There is no direct state aid for cogeneration of electricity and heat, but the legislation in force assumes support within the system of price regulation conducted by the Energy Regulatory Authority in the form of a price decision, which invariably lays down the level of support for the following calendar year. No long-term guarantee of the level of support is laid down and in this sense the support scheme does not therefore provide stable long-term investment conditions. The support scheme is universal and is not targeted to a specific sector.

Support for high-efficiency cogeneration of electricity and heat will from 1.1.2013 be newly regulated by a new act on promoted energy sources. The above-mentioned principles, however, shall remain. Entitlement to preferential connection to the transmission and distribution network for the purpose of electricity transmission shall also remain.

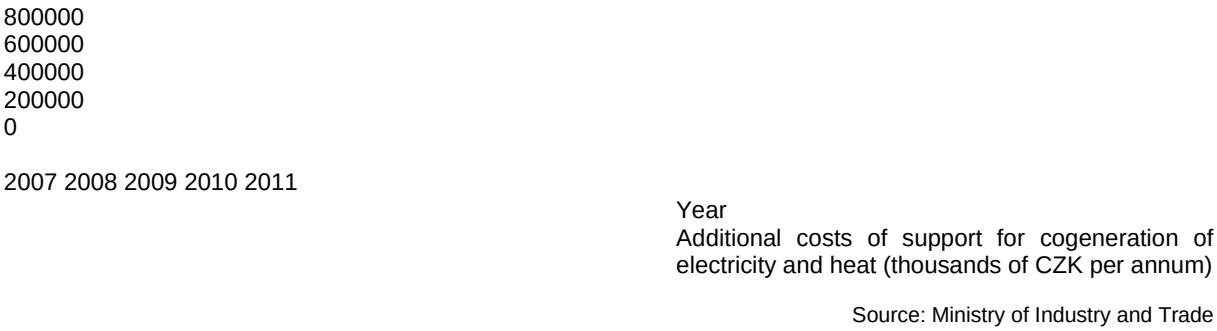
C. FUNDS INVESTED IN SUPPORT

The total costs of operational support for high-efficiency cogeneration of electricity and heat are presented in the table which follows:

Year	2007	2008	2009	2010	2011
Additional costs of support for cogeneration of electricity and heat (thousands of CZK per annum)	502 992	416 342	521 595	696 091	701 240

The Energy Regulatory Office is currently reviewing the system of support for high-efficiency cogeneration of electricity and heat and for this reason the level of funding intended for the promotion of cogeneration of electricity and heat for future years has not yet been determined.

Total costs of support for high-efficiency cogeneration of electricity and heat (thousands of CZK per annum)



Source: Ministry of Industry and Trade

CONCLUSION

The European Commission considers the cogeneration of electricity and heat to be an important instrument that is able to partly resolve European energy problems.

Certain barriers have a negative effect on the development of cogeneration (CEH), among them reports from Member States that are either lacking or submitted late. These complicate analyses and delay further proposals for support of cogeneration. One helpful instrument is APEE, which is regularly assessed and updated.

Cogeneration is considered a specific instrument to be used to increase energy efficiency and make savings. It also plays a part in the battle against climate change by reducing CO_2 emissions and reducing losses in the grid, thus helping the European Union achieve its objectives. It can also increase competitiveness, contribute towards economic development and create new jobs.

The generation of electricity was supplemented by the production of heat in the Czech Republic in the past as part of reinforcing the grid system. One simultaneous priority is the effective use of the heat and electricity generated. And as a result of the reduction in national sources – coal – the use of high-efficiency technology that uses this source is now a priority. It is precisely the high level of use of the energy of fuel that is the advantage of cogeneration.

It would seem appropriate in the cogeneration of electricity and heat (cogeneration and micro-cogeneration) to direct the use of gas with regard to its environmental properties. The use of waste at combustion plants with cogeneration would also appear significant, with the aim of achieving a combustible component of waste of up to 80 % following waste sorting.

The Czech Republic pays attention to stabilising centralised supplies of heat based on national sources (heat from nuclear power stations (NPS), coal, RES) supplemented by natural gas. Furthermore, the gradual conversion of heating plants to cogeneration with the effective use of heat pumps, the use of the accumulation abilities of heating plant sets in combination with heat pumps and a number of other steps and measures designed to make the Czech energy industry more effective.

As in other European countries, national energy draws on a valid energy concept, which in the case of the Czech Republic is entitled the State Energy Concept (SEC)[4].

[4] The valid wording of the SEC is available at the Ministry of Industry and Trade website: http://www.mpo.cz.

ABBREVIATIONS USED

CR	Czech Republic
EEC	European Economic Community
ERO	Energy Regulatory Office
EU	European Union
Eurostat	The statistical office of the European Union
IEA	International Energy Agency in Paris
NPS	Nuclear power station
CEH	Cogeneration of electricity and heat
MIT	Ministry of Industry and Trade
RES	Renewable energy sources
SEC	State energy concept
SEF	State Environmental Fund
UNECA	United Nations Economic Commission for Europe
PES	Primary energy savings

ANNEXES

TABLE 1:
DIVISION OF CAPACITY AND GENERATION OF ELECTRICITY, HEAT AND FUEL 2002 – 2010 ACCORDING TO TECHNOLOGY USED

TABLE 2:
TOTAL OVERVIEW AND SEGMENTATION OF COGENERATION (CEH) 2005 - 2010

TABLE 3:
TOTAL GENERATION OF ELECTRICITY AND HEAT 2008 - 2010

TABLE 1: DIVISION OF CAPACITY AND GENERATION OF ELECTRICITY, HEAT AND FUEL 2002 – 2010 ACCORDING TO TECHNOLOGY USED **(Source: MIT)**

Technology				TOTAL	Combined cycle gas turbines (CCGT) with heat regeneration	Back pressure gas turbines	Condensation gas turbines with heat regeneration	Gas turbines with heat regeneration	Combustion engines	Microturbines	Other
2002	electricity	Capacity	[GW]	5.035	0.487	1.284	3.196	0.004	0.064		
		Generation	[TWh]	12.984	0.854	4.471	7.418	0.022	0.219		
	heat	Capacity	[GW]	20.825	0.683	9.753	10.178	0.008	0.203		
		Generation	[TWh]	42.900	1.224	21.008	20.095	0.054	0.520		
	fuel	Input	[PJ]	415.269	18.037	130.470	262.998	0.543	3.221		
2003	electricity	Capacity	[GW]	5.011	0.484	1.278	3.181	0.004	0.064		
		Generation	[TWh]	13.061	0.859	4.498	7.462	0.022	0.220		
	heat	Capacity	[GW]	21.136	0.693	9.898	10.331	0.008	0.206		
		Generation	[TWh]	42.361	1.208	20.744	19.843	0.053	0.513		
	fuel	Input	[PJ]	424.411	18.434	133.342	268.788	0.555	3.292		
2004	electricity	Capacity	[GW]	5.214	0.504	1.330	3.309	0.004	0.067		
		Generation	[TWh]	13.788	0.907	4.749	7.877	0.023	0.232		
	heat	Capacity	[GW]	20.817	0.683	9.748	10.175	0.008	0.203		
		Generation	[TWh]	42.342	1.208	20.734	19.834	0.053	0.513		
	fuel	Input	[PJ]	430.305	18.690	135.194	272.520	0.563	3.338		
2005	electricity	Capacity	[GW]	5.199	0.565	1.210	3.285	0.062	0.077		
		Generation	[TWh]	13.582	0.852	4.473	8.047	0.001	0.209		
	heat	Capacity	[GW]	20.106	0.678	8.049	11.221	0.059	0.099		
		Generation	[TWh]	41.853	1.120	18.790	21.604	0.002	0.336		
	fuel	Input	[PJ]	394.554	18.127	127.272	246.256	0.056	2.843		

Technology				TOTAL	Combined cycle gas turbines (CCGT) with heat regeneration	Back pressure gas turbines	Condensation gas turbines with heat regeneration	Gas turbines with heat regeneration	Combustion engines	Microturbines	Other
2006	electricity	Capacity Generation	[GW] [TWh]	4.872 12.709	0.202 0.300	1.194 4.395	3.340 7.826	0.062 0.006	0.074 0.182		
	heat	Capacity Generation	[GW] [TWh]	19.949 39.782	0.309 0.399	8.133 17.849	11.351 21.252	0.059 0.010	0.097 0.271		
	fuel	Input	[PJ]	378.062	3.317	119.263	252.833	0.271	2.378		
2007	electricity	Capacity Generation	[GW] [TWh]	4.633 11.431	0.205 0.314	1.119 3.987	3.194 6.921	0.038 0.003	0.077 0.206		
	heat	Capacity Generation	[GW] [TWh]	18.656 34.574	0.331 0.615	7.231 14.999	10.927 18.641	0.064 0.005	0.103 0.314		
	fuel	Input	[PJ]	389.643	4.138	110.993	271.567	0.099	2.846		
2008	electricity	Capacity Generation	[GW] [TWh]	4.822 11.876	0.205 0.333	1.222 4.083	3.218 7.071	0.063 0.004	0.114 0.385		
	heat	Capacity Generation	[GW] [TWh]	19.656 35.449	0.331 0.491	7.321 15.101	11.605 19.357	0.168 0.007	0.231 0.494		
	fuel	Input	[PJ]	398.242	3.956	111.149	278.341	0.156	4.640		
2009	electricity	Capacity Generation	[GW] [TWh]	4.764 11.045	0.198 0.290	1.208 3.810	3.178 6.602	0.063 0.003	0.117 0.340		
	heat	Capacity Generation	[GW] TWh]	19.011 33.306	0.283 0.399	7.083 14.535	11.303 17.884	0.170 0.005	0.172 0.482		
	fuel	Input	[PJ]	244.014	3.100	100.141	137.081	0.054	3.638		
2010	electricity	Capacity Generation	[GW] [TWh]	4.799 12.240	0.188 0.243	1.240 4.425	3.160 7.247	0.063 0.003	0.148 0.322		
	heat	Capacity Generation	[GW] TWh]	20.548 37.687	0.297 0.342	8.082 17.571	11.763 19.209	0.190 0.006	0.216 0.558		
	fuel	Input	[PJ]	268.785	2.474	111.742	150.660	0.057	3.852		

[4] Within the scope of the jurisdiction of Directive 2004/8/EC.

TABLE 2: TOTAL OVERVIEW AND SEGMENTATION 2005 – 2010 **(Source: MIT)**

Summary				Electricity generation[1] as part of cogeneration of heat and electricity, capacity, input fuel	Generation by public generators, capacity, input fuel	Gene ration by enterprise generators, capacity, input fuel	Share of cogeneration in total electricity generation	Heat generation as part of cogeneration	Public generators	Enterprise generators	Share of cogeneration in total heat generation	Primary energy savings (PES)[3]	Prevented CO2 emissions
2005	electricity	capacity generation	[GW] [TWh]	5.199 13.582	3.849 9.304	1.350 4.278	0.164					PJ	tCO2
	heat	capacity generation	[GW] [TWh]					20.106 41.853	14.146 25.237	5.960 16.616			
	fuel	total	[PJ]	394.554	253.771	140.783							
		natural gas	[PJ]	36.518	10.957	25.561							
		black coal lignite	[PJ]	98.608 214.404	74.795 151.770	23.813 62.634							
		renewable sources	[PJ]	0.000	0.000	0.000							
		oil and oil products	[PJ]	4.517	3.429	1.088							
		biomass	[PJ]	13.494	2.416	11.078							
		biogas	[PJ]	3.071	0.309	2.762							
		waste combustion	[PJ]	3.373	0.603	2.770							
		stored gas	[PJ]										
		other fuel	[PJ]	20.569	9.492	11.077							

Summary				Electricity generation[1] as part of cogeneration of heat and electricity, capacity, input fuel	Generation by public generators, capacity, input fuel	Gene ration by enterprise generators, capacity, input fuel	Share of cogeneratio n in total electricity generation	Heat generation as part of cogeneration	Public generators	Enterprise generators	Share of cogeneration in total heat generation	Primary energy savings (PES)[3]	Prevented CO2 emissions
2006	electricity	capacity generation	[GW] [TWh]	4.872 12.709	3.860 8.929	1.012 3.780	0.151					PJ	tCO2
	heat	capacity generation	[GW] [TWh]					19.949 39.782	14.169 24.067	5.780 15.715			
	fuel	total	[PJ]	378.062	253.136	124.926							
		natural gas	[PJ]	17.447	11.016	6.431							
		black coal lignite	[PJ]	100.083 212.505	76.930 148.478	23.153 64.027							
		renewable sources	[PJ]	2.913	0.170	2.743							
		oil and oil products	[PJ]	7.651	2.328	5.323							
		biomass	[PJ]	13.413	2.984	10.429							
		biogas	[PJ]	2.822	0.456	2.366							
		waste combustion	[PJ]	1.300	0.762	0.538							
		stored gas	[PJ]										
		other fuel	[PJ]	19.928	10.012	9.916							

Summary				Electricity generation[1] as part of cogeneration of heat and electricity, capacity, input fuel	Generation by public generators, capacity, input fuel	Generation by enterprise generators, capacity, input fuel	Share of cogeneration in total electricity generation	Heat generation as part of cogeneration	Public generators	Enterprise generators	Share of cogeneration in total heat generation	Primary energy savings (PES)[3]	Prevented CO2 emissions
2007	Electricity	capacity generation	[GW] [TWh]	4.633 11.431	3.587 7.496	1.046 3.935	0.130					PJ	tCO2
	heat	capacity generation	[GW] [TWh]					18.656 34.574	13.109 19.768	5.547 14.806			
	fuel	total	[PJ]	389.643	263.361	126.282							
		natural gas	[PJ]	17.062	9.604	7.458							
		black coal lignite	[PJ]	71.580 254.489	49.506 190.150	22.074 64.339							
		renewable sources	[PJ]	4.312	1.410	2.902							
		oil and oil products	[PJ]	5.540	0.942	4.598							
		biomass	[PJ]	13.079	0.630	12.449							
		biogas	[PJ]	0.564	0.126	0.438							
		waste combustion	[PJ]	3.534	0.732	2.802							
		stored gas	[PJ]										
		other fuel	[PJ]	19.483	10.261	9.222							

Summary				Electricity generation[1] as part of cogeneration of heat and electricity, capacity, input fuel	Generation by public generators, capacity, input fuel	Generation by enterprise generators, capacity, input fuel	Share of cogeneration in total electricity generation	Heat generation as part of cogeneration	Public generators	Enterprise generators	Share of cogeneration in total heat generation	Primary energy savings (PES)[3]	Prevented CO2 emissions
2008	Electricity	capacity generation	[GW] [TWh]	4.822 11.876	3.764 8.016	1.058 3.860	0.142					PJ	tCO2
	heat	capacity generation	[GW] [TWh]					19.656 35.449	14.300 20.822	5.356 14.628			
	fuel	total	[PJ]	398.242	276.542	121.700							
		natural gas	[PJ]	20.039	11.437	8.602							
		black coal lignite	[PJ]	69.790 261.150	48.476 201.078	21.314 60.072							
		renewable sources	[PJ]	5.460	1.856	3.604							
		oil and oil products	[PJ]	5.916	1.430	4.486							
		biomass	[PJ]	14.135	1.874	12.261							
		biogas	[PJ]	0.836	0.157	0.679							
		waste combustion	[PJ]	3.388	0.973	2.415							
		stored gas	[PJ]										
		other fuel	[PJ]	17.528	9.261	8.267							

Summary				Electricity generation[1] as part of cogeneration of heat and electricity, capacity, input fuel	Generation by public generators, capacity, input fuel	Generation by enterprise generators, capacity, input fuel	Share of cogeneration in total electricity generation	Heat generation as part of cogeneration	Public generators	Enterprise generators	Share of cogeneration in total heat generation	Primary energy savings (PES)[3]	Prevented CO2 emissions
2009	Electricity	capacity generation	[GW] [TWh]	4.764 11.045	3.697 7.627	1.067 3.418	0.134					PJ	tCO2
	heat	capacity generation	[GW] [TWh]					19.011 33.306	13.672 19.904	5.339 13.403			
	fuel	total	[PJ]	244.014	158.709	85.305							
		natural gas	[PJ]	17.241	9.887	7.354							
		black coal lignite	[PJ]	52.619 138.089	39.298 97.894	13.321 40.195							
		renewable sources	[PJ]	5.268	2.118	3.15							
		oil and oil products	[PJ]	5.74	1.693	4.047							
		biomass	[PJ]	14.698	1.58	13.118							
		biogas	[PJ]	0.676	0.161	0.515							
		waste combustion	[PJ]	0.705	0.545	0.16							
		stored gas	[PJ]										
		other fuel	[PJ]	8.978	5.533	3.445							

Summary				Electricity generation[1] as part of cogeneration of heat and electricity, capacity, input fuel	Generation by public generators, capacity, input fuel	Generation by enterprise generators, capacity, input fuel	Share of cogeneration in total electricity generation	Heat generation as part of cogeneration	Public generators	Enterprise generators	Share of cogeneration in total heat generation	Primary energy savings (PES)[3]	Prevented CO2 emissions
2010	Electricity	capacity generation	[GW] [TWh]	4.799 12.240	3.976 9.049	0.823 3.191	0.142					PJ	tCO2
	heat	capacity generation	[GW] [TWh]					20.548 37.687	15.800 24.388	4.748 13.299			
	fuel	total	[PJ]	268.785	183.396	85.389							
		natural gas	[PJ]	19.803	10.959	8.844							
		black coal lignite	[PJ]	57.816 146.302	53.312 97.008	4.504 49.294							
		renewable sources	[PJ]	4.384	2.029	2.355							
		oil and oil products	[PJ]	5.112	1.249	3.863							
		biomass	[PJ]	13.763	3.805	9.958							
		biogas	[PJ]	4.773	0.180	4.593							
		waste combustion	[PJ]	2.584	0.667	1.917							
		stored gas	[PJ]										
		other fuel	[PJ]	14.248	14.187	0.061							

1 Only as concerns high-efficiency cogeneration according to Article 3 and Annex III of Directive 2004/8/EC.

2 All types of units generating electricity and heat.

3 In comparison with the separate generation of electricity and heat.

TABLE 3: TOTAL GENERATION OF ELECTRICITY AND HEAT 2008 – 2010

					2008			2009			2010			
Fuel	**Companies**	**Number of facilities**	**Electrical power (MW)**	**Thermal power (MW)**	**Electricity generation (GWh)**	**Heat generation (TJ)**	**Charge**	**Electricity generation (GWh)**	**Heat generation (TJ)**	**Charge**	**Electricity generation (GWh)**	**Heat generation (TJ)**	**Charge**	**Unit**
Brown coal	39	109	7,133	21,197	6,159	69,072	9,114	5,828	68,905	8,928	6,239	77,075	9,718	10^3t
Black coal	14	31	1,998	5,613	2,639	25,410	2,122	2,312	24,231	2,123	2,394	25,420	2,147	10^3t
Oils	15	16	193	924	168	4,012	127	143	3,388	113	115	2,834	93	10^3t
Biomass	16	-	-	-	192	3,888	726	382	4,937	1,006	367	4,826	1,061	10^3t
Waste	3	3	3	32	19	746	94	18	699	98	41	941	145	10^3t
Liquid fuels	2	2	9	79	5	188	6	14	150	7	4	100	4	10^3t
Natural gas	152	429	614	2,439	952	10,348	4,713	887	9,473	4,454	986	11,359	5,246	GWh
Biogas	81	183	49	63	138	789	84	200	872	132	275	1,299	191	10^6m^3
Other gases	11	27	175	314	1,098	8,646	3,969	750	6,822	3,005	852	8,006	3,679	10^6m^3
Waste heat	3	3	9	24	36	356	900	28	307	835	25	378	910	TJ
Total	**-**	**803**	**10,182**	**30,684**	**11,406**	**123 455**	**228 419**	**10,562**	**119 784**	**223 199**	**11,298**	**132 238**	**241 370**	**TJ**
Total energy generation (ERO)					83,518			82,250			85,910			
Share of electricity from CEH					13.7 %			12.8 %			13.2 %			

Compiled by: MIT, Department of Raw Material and Energy Statistics

Explanatory notes for table:
Number of companies – the number of companies that use the relevant fuel for cogeneration of electricity and heat. If the company has more than one type of fuel, it is counted for each one separately in the table.
Number of facilities – the number of facilities for cogeneration (CEH), among which are steam gas facilities with heat supply, back pressure steam turbines, condensation extraction turbines with heat recuperation, combustion piston engines, micro-turbines, Stirling engines, fuel cells, steam turbines, organic Rankin cycle or a combination of the facilities and technologies stated. In the case of the combustion of more than one type of fuel, the facility is only counted for the fuel which has the main energy share.
Electrical and heat power (MW) – the output of a cogeneration facility according to the technical data of the producer.
Electricity (GWh) and heat (TJ) generation – the values of cogeneration specified according to decree for the relevant fuel. The generation of heat is defined as the "supply of useful heat", meaning heat generated in cogeneration for use by another natural or legal person or for own technological use at the parent company (not for the own use of the electricity and heat generating plant). The electricity generated is therefore determined using the amount of useful heat.
Charge – the consumption of the relevant fuel in cogeneration. The relevant unit is specified for each group of fuels.