

## **COMBINED HEAT AND POWER ACTION PLAN**

### **Policy Action Plan for Promotion of Combined Heat and Power Production in the Czech Republic to 2010**

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## Abstract

Combined heat and power is well established in the Czech and Slovak Republic, especially in the district-heating sector. The current share in total electricity production is about 19% in the Czech Republic, and 11% in the Slovak Republic. Both governments aim to support CHP for reasons of energy efficiency improvement and, to some extent, mitigation of CO<sub>2</sub> emissions. However, different barriers hamper the further penetration of CHP. Therefore, this study aimed to support the Czech and Slovak government in the formulation of CHP policy. The project has delivered three documents: a background document (ECN-C--00-042) and national Action Plans for the promotion of CHP in the Czech and Slovak Republic, respectively (ECN-C--00-043/044). The Action Plans will provide policy makers in the Czech and Slovak government with concise information on potentials, priorities, and recommended policy actions.

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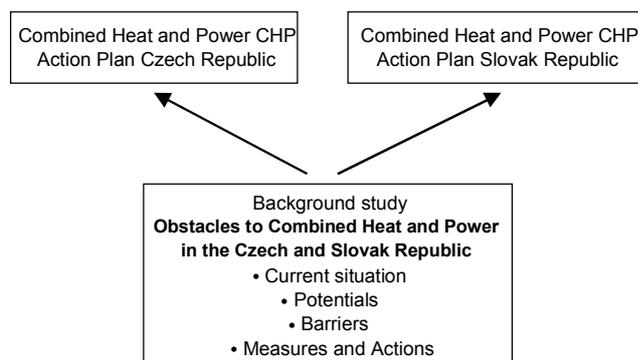
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## FOREWORD

Combined heat and power generation is well established in the Czech Republic. The current share of CHP in the electricity and heat production is high compared to the average in the European Union. Combined heat and power generation contribute to the three major goals of the national energy policy of the Czech Republic: overall competitiveness, security of supply and environmental protection. Therefore, the Czech Government aims to promote CHP. The Energy Policy Paper, which was approved by the Czech Government early January 2000, will provide the general framework for the future role of combined heat and power production in the Czech Republic. In addition, it is necessary to develop specific policies with attention to the impact of liberalisation of the energy markets on CHP.

The European Commission (EC) also promotes CHP. In 1997, the EC published its draft policy document concerning CHP and its targets for the period up to 2010. An Action Plan for CHP promotion is currently being developed by the EC, which deals with the changed situation resulting from the opening the energy markets. The EC promotes CHP development also in Associated EU Members. Therefore, the study 'Obstacles to the promotion of CHP in the Czech and Slovak Republics' was supported within the SAVE II programme (SA/085NL). The study was co-financed by the Dutch Government and the Czech Energy Agency. The project consortium consisted of the following Czech, Slovak, UK and Dutch institutes: the Netherlands Energy Research Foundation ECN (project leader), SRC International CS s.r.o., March Consulting s.r.o., March Consulting Group (UK) and the Slovak Energy Agency SEA. The project has resulted in the following documents:

- The *Combined Heat and Power (CHP) Action Plan* addresses the promotion of CHP in the Czech Republic (this report). The Action Plan provides policy makers in the Czech Government with essential information on potentials, targets, budgets and recommended policy instruments. The core of the Action Plan is the list of concrete policy actions, ready for implementation. The Action Plan focuses on medium- and small-scale applications. A similar Action Plan was developed for the Slovak Republic.
- *The background document (separate report)*. This report is the background document to the Action Plan. It contains detailed information on options and measures, potentials, barriers and policy instruments for promoting CHP. The main part is a detailed outline for a new CHP policy. Also, it includes recommendations for financing schemes to overcome the investment constraints in the Czech Republic.



## ABBREVIATIONS

AIJ/JI	Activities Implemented Jointly / Joint Implementation
CEA	Czech Energy Agency
CHP	Combined Heat and Power
DH	District Heating
EC	European Commission
EKIS	Energy Consulting and Information Centre of CEA
EPC	Energy Performance Contracting
ERO	Energy Regulatory Office
ESCO	Energy Service Company
ESF	Energy Savings Fund (Phare)
ET	Emission Trading
EU	European Union
GW	Gigawatt
IPP	Independent Power Producer
IPPC	Integrated Pollution and Prevention Control
IRR	Internal Rate of Return
MF	Ministry of Finance
MIT	Ministry of Industry and Trade
MoE	Ministry of the Environment
MW	Megawatt
NGO	Non-Governmental Organisation
PJ	Petajoule
REAS	Regional Power Distribution Company
RD&D	Research, Development and Demonstration
SEA	Slovak Energy Agency
SEF	State Environmental Fund
SME	Small and Medium-sized Companies

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# 1. POTENTIAL FOR COMBINED HEAT AND POWER

## 1.1 Introduction

Combined heat and power (CHP) involves the simultaneous production of thermal and electric energy from the same primary energy source. CHP gives energy savings of 20-40% and a reduction of up to 50% in CO<sub>2</sub> emissions, compared with the separate production of heat and electricity. CHP applications in the Czech Republic can be roughly categorised as follows:

1. Large-scale (> 50 MW<sub>e</sub>) CHP plants in large public district heating systems and industry. The main technologies are conventional CHP plants with steam cycle or with combined cycle (i.e. gas turbines with heat recovery and steam turbines).
2. Medium-scale plants (5-50 MW<sub>e</sub>) in municipal district heating systems, industry, and large building complexes. The main technologies are conventional plants with steam cycle.
3. Small-scale applications (50 kW<sub>e</sub>-5 MW<sub>e</sub>), primarily in small district heating systems, small industries, and in the commercial sector. The main technologies are gas piston engines with heat recovery.

In this chapter, all three CHP applications mentioned above are considered. Large condensing power plants with limited heat extraction or with high power to heat ratios are not considered CHP, because they do not meet the European Commission's criteria for CHP efficiency. The Action Plan however will focus on the promotion of medium and small-scale applications, because the specific economic conditions for large-scale CHP projects require a more project-based approach.

## 1.2 Current situation and recent developments

Combined heat and power is well established in the Czech Republic. The total installed capacity in the Czech power system is about 15 GW<sub>e</sub>. The share of CHP capacity is about 40% (6 GW<sub>e</sub>). The share of CHP plants in the total domestic power production is about 19% (12,4 TWh), which is about twice the average share of CHP in the European Union, but only about half the share in the Netherlands, Denmark, and Finland. The annual heat supply in district-heating systems (DH) is 520 PJ with a CHP-share of 19%. The total heat supply consists of about 53% steam supply and about 47% hot water supply. Figure 1.1 shows the share of CHP in total electricity generation in the Czech Republic, the Slovak Republic and the European Union.

In recent years, a few *large-scale* projects were realised in the Czech district-heating sector. A number of large-scale CHP plants were upgraded using new technologies (fluidised bed boilers, gas-steam CCGT scheme, e.g. at Kladno (2 steam units with fluidised bed combustion boilers, 135 MW<sub>e</sub> and 1 combined-cycle CHP unit, 67 MW<sub>e</sub>). Some large boiler plants were replaced by combined-cycle CHP plants, for instance in Brno (95 MW<sub>e</sub>/140 MW<sub>th</sub>). Recently, *medium-scale* CHP projects were realised in industry, e.g. at Kyjov (23 MW<sub>e</sub>, gas-steam CCGT plant) and district heating, e.g. the rehabilitation of the Olomouc CHP plant (fluidised-bed boiler, 41 MW<sub>e</sub>), the Pilsen CHP plant (fluidised-bed boiler, 50 MW<sub>e</sub>), the Skoda Mladá Boleslav CHP plant and the Zlín CHP plant. Most projects were the rehabilitation of existing old CHP and/or boiler plants. More than 500 *small-scale* CHP plants, mostly gas engines with heat recovery coolers, are installed in the 90's with a total capacity of about 75 MW<sub>e</sub>. Most applications can be found in small municipal district heating systems, industry and the commercial sector (including biogas and landfill gas use). A number of small-scale projects received subsidies by Czech Energy Agency (CEA) or the State Environmental Fund (SEF).

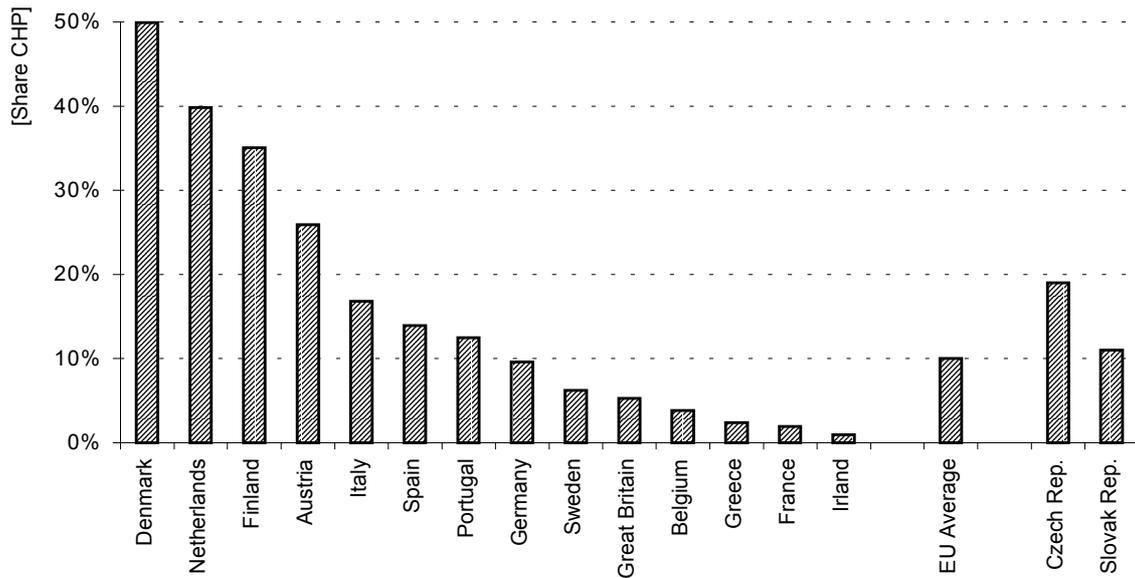


Figure 1.1 *Share of CHP in total electricity generation in the Czech Republic, some selected countries and in the EU*  
(Source: COGEN Europe and own analysis)

Although a significant number of projects have been realised, the total installed new capacity is small compared to the potential. Furthermore, at present, the willingness to invest in medium-scale and small-scale CHP projects without substantial government support is decreasing. This is mainly caused by:

- Low feed-in tariffs.
- Uncertainty with regard to future regulatory conditions for CHP.
- The expected opening of the power market in combination with the existing overcapacity. The main competitors for new CHP capacity are, apart from the existing coal fired power plants, new nuclear capacity (Temelin NPP, 2000 MWe, due to be commissioned soon). In the future, also the import of electricity could increase. The overcapacity is increased by the decreasing electricity demand in recent years.
- Strong competition on the heat market from gas-fired local heating.

### 1.3 Potential in 2010

Two potentials for CHP have been estimated: the technical and economic potential. The technical potential assumes the exploitation of the theoretical potential by implementing all technically feasible CHP options. The economic potential considered the economic viability of CHP projects. It should be noted that these potentials strongly depend on the technical and economic assumptions and should be regarded as indicative only. Only medium-scale (<50 MW<sub>e</sub>) and small-scale applications are considered.

#### *Technical potential*

The technical potential includes all technically feasible medium and small-scale CHP options and is limited mainly by technical considerations (mainly demand for heat and availability of heat distribution systems). Rehabilitation of existing CHP plants however is excluded from this potential. The total technical potential for new capacity (< 50 MW<sub>e</sub>) in 2010 is estimated at 2000 MW<sub>e</sub>. This corresponds to a 30% increase of currently installed capacity.

Table 1.1 *Technical potential of new CHP plants in the Czech Republic in 2010*

	Capacity range			Heat/power production ratio
	[MW <sub>e</sub> ]	[MW <sub>e</sub> ]	[MW <sub>th</sub> ]	
Medium-scale-Industry	5-50	850	1180	1.4
Medium-scale-DH	5-50	400	560	1.4
Small-scale	0.05-5	750	1250	1.7
Total		2000	2990	1.5

The main applications of CHP within the three categories are as follows. All options include use of fossil fuels (coal, natural gas, oil) and renewable energy sources (wood, straw, biogas):

1. *Medium-scale CHP plants in industry.* This includes primarily the replacement of old boilers by new ones, in many cases including switch from coal to gas, rehabilitation/ replacement of existing steam turbines and/or installation of new steam turbines or of gas turbines.
2. *Medium-scale CHP plants in district heating.* This category includes a large variety of CHP plants-CHP plants, e.g. with back-pressure steam turbines, extraction turbines or large gas engines.
3. *Small-scale CHP plants.* Many new projects with gas engines in municipal district boiler plants, in sewage treatment plants, and commercial services.

### *Economic potential*

Due to major economic barriers for CHP implementation, it is more realistic to use the economic potential of the different CHP options for setting implementation targets. A range of economic assumptions influences this economic potential. To estimate the impact of these assumptions on the economic potential three scenarios were developed:

1. Business as usual: prolongation of current economic and legislative conditions for CHP.
2. Increased feed-in tariff: increase of current feed-in tariffs for medium- and small-scale CHP plants.
3. Strong governmental support of CHP: significant increase of subsidies and good financial opportunities.

The results of calculation by scenario of the penetration of CHP, are presented in comparison with the base year (1995). To estimate the economic potential, a time horizon of ten years (till 2010) has been applied. The pay-back period was calculated for a range of different CHP schemes. Schemes with a payback period below 8 years were considered economical. Detailed information on these economic scenarios can be found in the background document to the Action Plan. The economic potential in the business-as-usual scenario is rather small. An increase of the feed-in tariff will substantially increase the profitability of CHP projects, thus increasing the economic potential, more than the use of subsidies. As a result, regional differences of feed-in tariffs will have a major impact between the application and share of CHP in these regions. In Table 1.2 the results are summarised for the scenario with a increased level of feed-in tariffs. The economic potential is 650 MW<sub>e</sub>, corresponding to about one third of the technical potential.

Table 1.2 *Economic potential for new medium and small-scale CHP plants till 2010*

	Capacity range			Economic/Technical potential [%]
	[MW <sub>e</sub> ]	[MW <sub>e</sub> ]	[MW <sub>th</sub> ]	
Medium-scale-Industry	5-50	290	400	34
Medium-scale-DH	5-50	210	300	53
Small-scale	0.05-5	150	250	20
Total		650	950	33

## 1.4 Conclusions

Despite the existing high share of CHP, a large technical potential still remains in the Czech Republic. The technical potential is estimated at 2000 MW<sub>e</sub> of additional capacity in the year 2010. The economic potential strongly depends on economic conditions. Slightly more favourable conditions than at present would give the CHP economic potential of 650 MW<sub>e</sub> in the period up to 2010. This represents an increase of 10% in CHP capacity compared to the year 1999. Out of the total increase in CHP capacity, 15-20% can be attributed to small CHP plants. The total increase in the capacity of CHP plants would correspond to an extra output of about 3 TWh/year, which would, for the main part, replace the present output of condensing power plants. In consequence, the share of CHP plants in total electricity generation could rise from 19% to 23%, i.e. by 20%. The rate of CHP penetration based on biomass will be comparable with the rate of CHP penetration based on natural gas, but the penetration of this biomass technology come about 5 years later.

## 2. POLICY OBJECTIVES AND PRIORITIES

### 2.1 Objectives and targets

Combined heat and power generation contributes to the three major goals of the national energy policy of the Czech Republic: overall competitiveness, security of supply and environmental protection. Also the accession to the EU is a motivation for the promotion of CHP because CHP plays an important role in the European Union's energy efficiency and climate change policy. The European Union's unofficial but ambitious target regarding the share of CHP is doubling the share of CHP from 9% in 1995 to 18% of electricity production in 2010<sup>1</sup>. The European Commission invites the member countries to remove barriers to the penetration of CHP, and encourages them to develop their national strategies and lay down targets for CHP promotion within the co-ordinated EU strategy.

In the Czech Republic the share of CHP has already reached 19% which seems relatively high as compared with the current and target average levels in the EU. Nevertheless, compared with countries where the share of CHP is high (up to 50%), the CHP share in the Czech Republic remains relatively low. The Energy Policy Paper, which has been approved by the Czech Government recently (January 2000), will provide the general framework for the future role of combined heat and power production in the Czech Republic. To promote CHP, it is necessary to develop a specific policy that would formulate the targets and set out measures and instruments for achieving these targets. The Action Plan will support this policy developing process by recommending measures and actions for the promotion of medium and small-scale CHP.

The Czech Government should set specific official targets for CHP development for the medium term (2010), priorities of the process and instruments for CHP promotion. Besides the construction of new capacity, also replacement of existing capacity is required in the period to 2010. As a consequence, CHP targets for 2010 have to deal with additional capacity as well as with the replacement of existing capacity. Furthermore, these targets should be consistent with the targets of the proposed Energy Efficiency Action Plan and the Renewable Energy Action Plan (biomass CHP)<sup>2</sup>. As the target, a 20% increase of CHP share in total generation in the period to 2010 might be set, based on the assessment of the economic potential.

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1 A Community strategy to promote combined heat and power and to dismantle barriers to its development, European Commission Brussels, 15.10.1997, COM(97) 514 final.

2 The Energy Efficiency Action Plan and the Renewable Energy Action Plan for the Czech Republic were prepared within the framework of the National Energy Efficiency Study for the Czech Republic (1999). These documents were published in English and Czech by the Netherlands Energy Research Foundation ECN (ECN-C-99-063, 064 and 065), and SRC International CS Prague, respectively.

## 2.2 Priorities

Priorities should be set in CHP policy with regard to those CHP applications that are most promising and need the most support. Based on the analysis of the technical and economic potential of CHP and the possible impact on the environment in the Czech Republic, the following fields can be identified as the most attractive for implementation of medium and small-scale CHP and should therefore be the focus of CHP policy:

1. *Replacing old medium-size CHP plants in industry and district heating.* The old CHP plants in district heating and the industrial sector can be replaced by new options (fluidised bed CFB, combined-cycle gas units etc.). This replacement will not result in structural change in heat and power production.
2. *Replacing small municipal boiler plants* by small-scale CHP-options ( $< 5 \text{ MW}_e$ ). In the district-heating sector many out-dated low-efficiency coal-fired and gas-fired heat-only boilers are still in use. These boilers can be replaced by more efficient small-scale options (e.g. CHP plants with gas engines). This replacement will result in a structural change in local heat and power production.
3. *Installation of medium and small-scale CHP options in industry, and small and medium enterprises.* In the industrial sector major efficiency improvements can be achieved by application of natural gas-fired CHP options. This replacement will result in a structural change in local power production and demand.
4. *Biomass fired CHP options* (wood, straw or biogas-fired plants). Although these options are not yet widely used and are not profitable in most cases, their application deserves special attention because it both contributes to increasing energy efficiency, as well as increases the share of renewable energy. Moreover, biomass-fired CHP plants do not produce additional greenhouse gas emissions.

### 3. BARRIERS FOR COMBINED HEAT AND POWER

The main barriers to CHP in the Czech Republic can be summarised as follows:

#### *Lacking policy framework*

A clear policy framework to promote the CHP development and implementation with CHP targets and priorities is still lacking. The promotion of an economically efficient CHP development is included among short-term and medium-term priorities of the Czech Government energy policy, but neither the specific instruments nor the timetable for their implementation are established.

#### *Inadequate institutional framework*

At the moment, co-operation between the various stakeholders and the Government in the promotion of CHP is weak. A strong institutional framework for CHP is required as a solid common basis for improving energy efficiency in the Czech Republic.

#### *Lacking regulatory framework*

At present no regulatory framework complying with the respective EU Directives has been established. The proposal of a new Energy Act is being discussed. The Energy Management Act defining the role of CHP has not yet been approved by the Parliament. Several important barriers to the development of CHP arise from the lack of regulations that could make CHP producers less dependent of the electricity network utilities. Despite the fact that legally free access to the grid exists for independent producers, in practice inadequate payment for sales of electricity to the grid and high tariffs for stand-by and top-up supplies offered by the distribution company disqualify the CHP alternative. These are key barriers to the penetration of CHP even in a partly liberalised European energy market. Regarding the future liberalisation of the electricity and gas market, the Czech Republic has not established regulation for market opening yet (grid access, transport tariffs etc.). In the current proposals, the CHP promotion has not been considered enough.

#### *Pricing and tariffs*

Major economic barriers in generation and sale of electricity and heat arise from the distorted prices. These are due to cross subsidies designed mainly to support households. Industry and SME pay a higher than cost-based price for electricity and gas, while households benefit from cross subsidies. Heat tariffs for all categories of consumers are cost-based, in most cases. This situation leads to incorrect decisions made by consumers: massive use of gas in households, direct use of gas for heating, and very slight interest in district heating. The cross subsidies should be removed in the near future (till end 2002). Until then the low electricity prices and the necessity to keep heat prices competitive to cross-subsidised gas prices in the household sector do not create economic conditions for cost-effective investments in CHP production. Non-payment for heat is also a significant problem for heat delivery.

Before the new Energy Act is in force, the electricity network owners as well as the district heating systems' owners are natural regional monopolies. Below certain maximum limits set by the regulator (currently the Ministry of Finance) they can set the prices of electricity and gas individually. These maximum tariffs, however, do not apply for electricity purchased to the distribution grid. This results in low electricity feed-in tariffs and the necessity to recover the cost by reflecting them in heat prices for households as there is no maximum heat price level set and objective regulation of heat prices is only applied. Adequate feed-in prices are crucial for the cost-effectiveness of CHP. Current electricity tariffs often do not enough consider the benefits of CHP.

### *Surplus in electricity supply and impact of the opening of energy markets*

The decline in electricity demand in the Czech Republic over the past few years, the commissioning of new power plants, including CHP plants and the Temelin nuclear plant, and the possible import of electricity, will probably result in a significant overcapacity in electricity supply in the future. Furthermore, the opening of the electricity and gas markets will put plants that are most economical at an advantage. This may prove to be a serious obstacle to the construction of new CHP plants, the commissioning of plants currently under construction, and the operating of existing plants.

### *Possible drop in heat demand as a result of energy efficiency improvement*

Distribution losses in district heating systems and losses in the end use of heat in the Czech Republic are higher than in EU countries. Energy efficiency can be improved by the reconstruction of district heating systems, by individual heat consumption control and metering, by implementation of energy saving measures and by the increase in heat prices. Energy savings achieved in real terms are estimated at about 20-40% depending on the type and the size of the district heating system and the category of heat consumption. The introduction of energy efficiency measures results in a decrease of heat demand unless new consumers are connected to the system, and in the decline of economic efficiency in heat supply. The right dimensioning of CHP plants according to the current and future heat demand is necessary. Shutting down a heat-only boiler in the future is a better solution than operating a CHP plant at half its capacity.

### *Difficult financing*

In the Czech Republic the problems connected with financing CHP investments *is not the lack of capital itself*, but the *disproportion* between the expectations and requirements of the private financiers. This refers to the conditions of available financial sources on one hand, and the economics (low rate of return on the investment) of the CHP alternatives compared to heat-only solutions on the other hand. For investments in CHP projects, specific financial institutions other than banks, like investment funds and other financial groups are lacking. The rules for depreciation have been improved in the Czech Republic but the impacts of depreciation on the price of heat can make the heat produced in CHP not competitive with heat-only options due to its high capital costs. In-house capital is either scarce or used for investments with higher internal rate of return than those achieved by CHP schemes. Low revenues of CHP investments make access to commercial financing difficult, due to high price of the Czech capital. For lenders, CHP projects are associated with high risks because existing uncertainties in revenues for electricity and in competitiveness of heat, given by other than commercial barriers, make even long-term agreements on electricity and heat purchase difficult to obtain. Small and medium-size CHP projects are too small to be interesting for international financial institutions and the credit-worthiness of many Czech investors is low. Finally, there is a shortage of trained and skilled staff to develop a bankable CHP project proposal, and investors don't know how to select qualified external assistance.

### *Lack of knowledge and awareness*

Many potential users and possible investors are not aware of the advantages of CHP, in particular of small-size CHP. Lack of experience leads to large overhead costs for the development of small CHP projects. The need for external qualified assistance is underestimated as well as the necessity of proper project development.

## 4. POLICY FRAMEWORK FOR CHP

An important precondition of large-size CHP development in the Czech Republic is the definition of the long-term government objectives and strategy in energy efficiency, including CHP promotion. Two external commitments also contribute to the need for a policy framework for CHP. First, by signing the Protocol to the Energy Charter Treaty on Energy Conservation and Related Environmental Issues, the Czech Republic has committed itself to draw up a programme to support energy conservation, including CHP. This includes relevant legislative and regulatory measures as well as subsequent enforcement. Secondly, one of the basic political objectives of the Czech Republic is accession to the European Union. Increasing the share of CHP is an important objective of the European Commission, which is addressed in the Community Strategy to promote Combined Heat and Power (1997). In the Energy Policy approved by the Government in December 1999, support of CHP implementation is one of the short- and medium-term goals. Nevertheless no concrete action plan has been elaborated.

Given the specific characteristics of CHP technologies, applications and markets, including the need for district heating system construction and operation, a separate CHP Action Plan is required. This Action Plan would clearly define the policy of the Czech Government in this field thus reducing the uncertainty of future developments, which troubles the current operators of CHP plants and district heating systems, as well as potential investors. The CHP Action Plan should formulate the government objectives and targets, and the set of policy measures to achieve these targets, including the role of other stakeholders in the economy, and assessment on possible costs and benefits of the implementation of the plan. The document will commit the Government to its targets and will be a necessary basis for the involvement of the other stakeholders, which must also support the policy. Full account should be taken of the relevant European Union regulations, the Community draft strategy of CHP promotion and the Community Action Plan for CHP which is currently under preparation, as well as the commitments arising from the Protocol to the Energy Charter.

CHP policy is strongly interlinked with energy policy and energy efficiency policy and, in the case of biomass fuelled CHP, with renewable energy policy as well as environmental policy. The CHP Action Plan should therefore be harmonised and integrated into the overall energy (and environmental) policy framework prepared by the Czech Government. The Government assumes that the Energy Management Act will take effect in 2001. The draft Act envisages that a CHP obligation will be imposed in clearly specified cases. In 2001, the new Energy Act is also due to come into force. This Act will lay down conditions for business activities in the energy sector taking into account the opening of energy markets. The CHP Action Plan should be harmonised with the Energy Efficiency Action Plan and the Renewable Energy Action Plan<sup>3</sup>. Figure 2 shows the relationship between the policy documents and acts.

After developing and implementing a new CHP policy, it is very important to monitor and evaluate the achieved results. The Energy Efficiency Policy will need regular updates to adapt to changing external conditions and changing priorities. This is done on the basis of the actual development of energy consumption, which will indicate the success of the policy. Therefore a prerequisite for policy monitoring is an improvement of the quality and availability of statistical data, because currently the statistics on CHP utilisation are poor. This is many true in case of small-size CHP plants, which are not covered by current statistical system.

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<sup>3</sup> The Energy Efficiency Action Plan and the Renewable Energy Action Plan for the Czech Republic were prepared within the framework of the National Energy Efficiency Study for the Czech Republic (1999). These documents were published in English and Czech by the Netherlands Energy Research Foundation ECN (ECN-C--99-063, 064 and 065), and SRC International CS Prague, respectively.

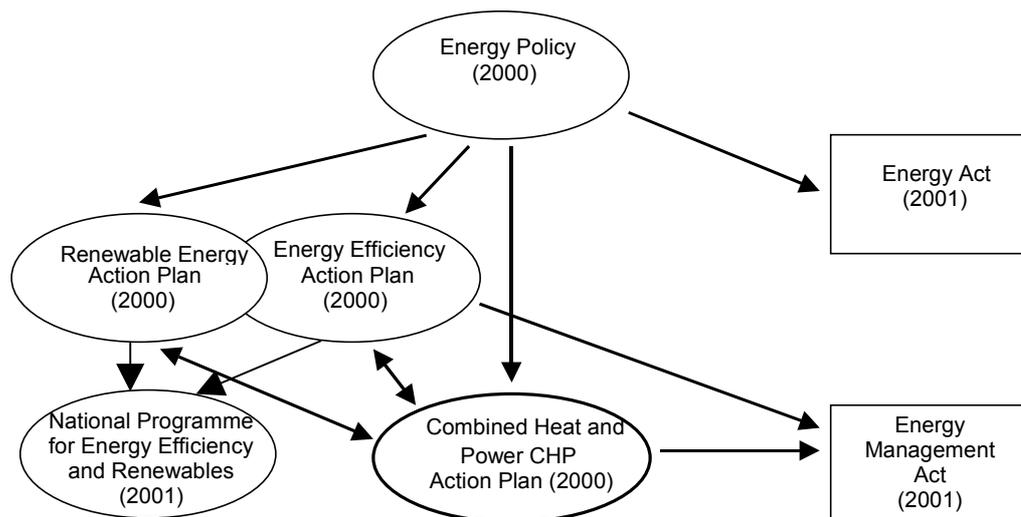


Figure 4.1 *Overview of proposed policy documents and acts including (recommended) date of enforcement*

#### *Actions - Policy framework for CHP*

1. 2000: The Ministry of Industry and Trade (MIT) will propose targets for the development of CHP in the Czech Republic.
2. 2000: MIT, in co-operation with the Ministry of the Environment (MoE), will prepare an Action Plan for the Promotion of CHP (the CHP Action Plan). The Competence Law will be strictly followed<sup>4</sup>.
3. 2000: MIT will ensure consistency between the Energy Act, the Energy Management Act, the National Programme for Energy Efficiency and Renewables, the proposed Energy Efficiency Action Plan and the Renewable Energy Action Plan with regard to the promotion of CHP.
4. 2001: MIT will complete the CHP Action Plan taking into account the respective Action Plan developed by the European Commission. The Czech CHP Action Plan will be approved.

#### *Actions - Monitoring and evaluation*

1. 2000-2010: The Ministry of Industry and Trade (MIT) will monitor the development of CHP on a yearly basis to be able to assess the progress of CHP policy, and will report on the progress.
2. 2001: The Czech Statistical Office in close collaboration with the Energy Regulatory Office will implement a new system of statistical data collection from all licence holders on power and heat production to ensure maximal coverage of the CHP installed capacity and output.
3. 2000-2002: MIT will separately evaluate the key measures in CHP policy. The impact and costs of the policy measures and possible improvements will be assessed.
4. 2002-2010: The CHP Action Plan will be updated every three to four years.
5. 2000: The Ministry of Industry and Trade will elaborate an evaluation methodology with more attention to the monitoring of the field results and to the feedback of the support recipients.

<sup>4</sup> Taking into account the current split of responsibilities given by the Competence Law, every issues related to energy supply is the responsibility of MIT, but the Ministry of the Environment is also active in this field. Current practice is that both Ministries elaborate common policy papers and present them to the Government.

## 5. INSTITUTIONAL FRAMEWORK

A strong institutional framework for CHP is required as a solid common basis for improving energy efficiency in the Czech Republic. It is necessary to strengthen the role of the Czech Energy Agency as a central institution responsible for implementation and monitoring of CHP policy. Furthermore, the capacity at the governmental level in the field of CHP should be improved. Finally, international co-operation should be intensified.

### *Czech Energy Agency*

Currently, the main governmental body responsible for promotion of energy conservation is the Czech Energy Agency (CEA), while the State Environmental Fund (SEF) is also active in this field. The activities of the two institutions should be co-ordinated both in the phase of the development of the National Programme and the yearly State Programmes for Promotion of Energy Efficiency and Renewables, and in the phase of their implementation and of the evaluation of the results in the field of CHP promotion.

### *Extending professional background of ministries in energy issues*

On all ministries that operate large building stock, or are responsible for heat and electricity supply or distribute subsidies to energy savings, at least one person should be responsible for energy issues. This person should have a relevant professional background. Currently, only a few ministries employ such experts. Their role will be to monitor the situation in energy consumption and efficiency, to prepare energy savings programmes, to prepare inputs in the government register of investments and to collaborate closely with the Czech Energy Agency on implementation of the energy conservation programmes in relevant sectors, including the development and implementation of CHP projects. The Ministries concerned are: the Ministry of Regional Development, Ministry of Agriculture, Ministry of Defence, Ministry of Interior, Ministry of Education, Ministry of Labour and Social Affairs, Ministry of Health, Ministry of Finance, Ministry of Culture, Ministry of Transport, Ministry of Justice.

### *Interest groups*

Associations supporting the interests of various groups (producers, suppliers or consumers) play an important role in the promotion of CHP. The activities of these groups have, in the past, lacked co-ordination. A co-ordinating role might in the future be played by one of the associations, e.g. COGEN Czech Republic and the District Heating Association.

### *International co-operation*

The Czech Republic should play a stronger role in the international networks for the promotion of CHP, in particular in COGEN Europe, and Euroheat and Power, Unichal. The contacts with the European Commission should be intensified in the field of CHP, also because the future potential of CHP in liberalised markets is increasingly a matter of concern in the European Commission, and some of its Member States. In view of the coming accession, it is important that the Czech Government advises the Commission on the potential impact of the energy acquis on CHP in the Czech Republic.

*Actions - Institutional framework*

1. 2001-2002: The staffing of the Czech Energy Agency will be increased to handle its tasks in the field of CHP (including the monitoring and evaluation of CHP programmes). About two more people would be required with an annual budget of CZK 1 million.
2. 2000: The Government and respective Ministries (MIT, MoE) will intensify the co-operation with the EU and its Member States to benefit from the experience in policy making in the field of the promotion of CHP.
3. 2000: Co-ordination of the interested groups' activities in the field of CHP promotion will be improved so that these groups' interests can be better supported at the Government and the Parliament levels, as well as at the international level.

## 6. REGULATORY FRAMEWORK

Energy and environmental regulation have a strong impact on CHP. In this section, the following relevant regulatory issues are discussed. Recommendations are given for improvements of existing legislation and the introduction of new regulation:

- Access of CHP producers to the power and heat grid.
- Priority dispatching of CHP plants and purchase obligations.
- Setting feed-in prices.
- Levies and taxation.
- Licensing of CHP producers.
- Authorisations for the construction of new CHP plants.
- Emissions.

New and revised legislation is currently under preparation in the Czech Republic. The above regulations should be incorporated into the Energy Act, the Energy Management Act and the amendments to environmental legislation (e.g. the Clean Air Act).

### 6.1 Access to the grid, priority dispatching and purchase obligation

With the opening of the electricity market, the currently prevailing forms of CHP promotion used in a number of countries including some EU countries, namely electricity and heat purchase obligations, regulated feed-in tariffs, could be in conflict with the effort to establish objective, transparent and non-discriminatory conditions for electricity trading at market prices. In consequence, most countries have been abandoning the above principles or, as a compromise, reducing them to priority dispatching or purchase obligation at regulated prices of electricity from renewables only.

In the Czech Republic, access to the grid is regulated. The current Czech energy legislation (in particular, Act No. 222/1994) clearly stipulates that the holders of power distribution licences must purchase electricity from combined heat and power production whenever it is technologically feasible. The draft new Energy Act introduces the requirements of EU Electricity Directive No. 96/92/EC on the opening of the Czech electricity market. The new Energy Act will not include the current obligation of power distribution licence holders to purchase electricity from combined heat and power production whenever it is technologically feasible. Instead, in the draft new Energy Act it is stated that producers that operate CHP plant enjoy the priority of power transport via power transmission and distribution networks if they ask for this transport and if it is technologically feasible. The wording of the draft new Energy Act opens access to the grid but does not impose an obligation to purchase power produced in CHP plant.

The dispatching and purchase of electricity from CHP plant should be regulated to reflect the EC Directive so as to ensure:

- Priority dispatch of the most efficient plant (in terms of the amount of fuel required to generate 1 kWh<sub>e</sub>), concerning all energy conversion plant supplying electricity to the network. This is regarded to be of national interest. However, in summer periods this may be disadvantageous for CHP plant as compared with other power generation schemes, but that depends on the type of plant with which the CHP is being compared.
- Purchase on an avoided cost basis.

### *Actions - Access to the grid, priority dispatching and purchase obligation*

1. 2000: The Ministry of Industry and Trade (MIT) and the Energy Regulatory Office (ERO) will prepare decrees to the new Energy Act which will specify in greater detail conditions for priority access of CHP plant to the grid and for the obligatory purchase of heat from CHP plant.
2. 2000: MIT will reconsider incorporating in the new Energy Act the obligation of purchasing renewable electricity from CHP plant. This electricity should be purchased at regulated prices set on an avoided costs basis.
3. 2000: MoE and MIT will draw up the principles of using revenues from the green cent scheme (see Section 6.3.2) for partly covering CHP investment and/or operational costs thus making energy from CHP plant competitive.

## 6.2 Price and tariff regulation

### 6.2.1 Electricity

#### *End-user prices*

Electricity prices for end users are regulated and fixed as maximum prices. On 1 January 2000 a new tariff system came into effect, which applies to all electricity users, except households. The new tariff system includes a wider range of tariffs, both for electrical energy (kWh) and capacity (kW), so that any consumer can choose a tariff best corresponding to his needs. Seasonal tariffs, different for the winter period (from October to March) and for the summer period (from April to September), have been introduced. This modification of the tariff system is a first step in developing a completely new tariff system, which is to come into effect in 2001.

The price structure for households remains unchanged, except for the maximum price, which has been increased in absolute terms. The completion of the adjustment of electricity prices charged to households is assumed to continue up to the year 2002 when prices for households and small business with similar consumption and voltage levels will be levelled. The major aim of the proposed price adjustment process is that all consumers will pay prices covering short-term marginal costs.

#### *Impact of liberalisation on electricity prices and tariffs*

The Czech Republic being an associated country to the EU committed itself to implement EU legislation. The opening of the electricity and gas markets will create a completely new environment for both producers and consumers. Within the preparation of a new Energy Act in the Czech Republic, major steps are proposed for electricity market opening which are based on the requirements of the EU Electricity Directive (see Table 6.1).

Table 6.1 *Major steps in opening the electricity market in the Czech Republic*

Date	Consumer capacity (single meter) [GWh]	Producer capacity [MW]	Milestones
January 2001			New Energy Act in full power
January 2002	>40	>10	
January 2003	>9	100%	Removal of subsidies
January 2005	>0.1	100%	
January 2007	100%	100%	

The main results of the electricity market opening from the price point of view are the following:

- The opening of competition could lead to an electricity price drop for some categories of end users, mainly large consumers, and thus reduce the interest for building own CHP plants.
- A reduction in consumer prices might trigger pressure for reduction in feed-in tariffs for electricity from IPPs and, in consequence, might lead to reduction in CHP plant profitability.
- The opening of competition will ease the access of IPPs to the grid and allow them to negotiate prices, especially if special services (system and ancillary services) can be offered.

Liberalisation of electricity markets in the United Kingdom, which began 10 years ago, resulted in reduction in electricity prices charged to industrial users of 15% to 20% and, at a later stage, in gas prices of more than 40%, and wound up many planned CHP schemes. A similar process can be foreseen in the Czech Republic if CHP does not receive any special support. Uncertainty over future energy prices has been a factor in the slow pace of implementation of CHP schemes in the UK. The new Energy Act in the Czech Republic seems likely to produce the same uncertainty about prices, which may mean that decisions on CHP plant construction and operation will be difficult to make.

The draft new Energy Act does not specify any conditions for setting feed-in tariffs for electricity from CHP plants. The price is left to be a competitive price on the electricity market. However, feed-in prices, high standby and top-up charges are not market prices; they represent barriers to CHP implementation and therefore should be regulated. Transparency of pricing would ease this situation. Specific regulations for each price/charge are discussed below.

#### *Feed-in tariff*

The current Czech energy legislation stipulates that the holders of power distribution licences are obliged to purchase electricity from combined heat and power production whenever it is technologically feasible. Although the Ministry of Finance could fix the price of electricity from CHP plant, in practice it is assumed that a licence holder (a regional power distribution company) should purchase electricity from independent producers at 'usual' prices. The 'usual' price in the Czech power sector is negotiated between the dominant power producer (CEZ a.s.) and the regional power distribution companies. Following the adoption of the Energy Act (Act No. 222/1994), the concept has been adopted that the power feed-in tariff should not exceed the price that the dominant power producer (CEZ a.s.) sets, which is a fixed price of CZK 1,030/MWh. In the following years, the feed-in tariff developed differently in different regions as a result of the different market strategy of individual regional power distribution companies. Today, the individual power distributors fix the power feed-in tariff within the framework of their business activities, according to established practices. The current average country-wide feed-in tariff from CHP sources operated by IPPs is approximately CZK 1,200/MWh. The average feed-in price offered by distributors to small and medium-sized CHP plants is higher: 2,000 CZK/MWh if they can also supply additional power in peak hours.

Basically, two ways of the future regulation of feed-in prices can be used: 1) fixed price. And 2) avoided cost. The first one is easy to set up and monitor, but may produce inconsistencies from one region to the next. Fixed price is not considered in the draft new Energy Act. The second one, an avoided cost basis, would allow each regional distribution company to set its own price for feed-in electricity, reflecting local conditions and respecting the adopted methodology. This would be more difficult to enforce, requiring transparency and auditing, which would be more costly than the first method.

#### *Standby charges*

A charge for standby capacity tends to be high to cover the worst situation, which reflects the dispatching of the least efficient plant during peak demand periods. Ideally, a retrospective assessment of real marginal cost would be the fairest approach to this issue since the worst case rarely occurs, but this may not be practical. It would involve complex individual calculations requiring sophisticated software and would be expensive to establish. An analysis of historical

performance would allow performing the calculation of average standby cost, perhaps on a regional basis. Average standby cost for the next year would then be calculated from data for the previous year. This method could form part of regulation ensuring a fair access of CHP to the grid. It is recommended that an analysis of the actual marginal cost is carried out for the past year and to use the resulting cost as a basis for setting a standby charge for the current year.

#### *Top-up charges*

There is again the danger that a fixed charge will probably reflect the worst case, so the retrospective calculation of the previous year's average top-up charge (transmission and distribution charge) is the best method of setting the charge for the following year. It is recommended to fix the price for electricity sold to 'eligible customers' on the basis of the previous year's usual sale price charged to that category of customers minus the previous year's transmission and distribution charges. This part of the Electricity Directive (§ 18-2) could be applied only after electricity prices are brought in line with the real production and delivery costs (after 2002 in the Czech Republic). The provisions of the Directive and of other EU regulations are to be embodied in the new Energy Act whose draft is currently being discussed. This regulation should be in compliance with the requirements of the EU Electricity and Gas Directives, namely with paragraph (24) of the Electricity Directive, concerning autoproducers and independent producers, and with paragraph (22) of the Gas Directive, mentioning the transparency of tariffs.

#### *Additional (ancillary) services by IPPs*

Under the current conditions in the Czech power system, the independent operators of CHP plant are not required to provide any additional services to distribution companies when selling electricity to them. The future open electricity market, however, may give an opportunity to small independent power producers to provide related additional services (ancillary services) thus giving them a chance to increase their revenues from power supply to the distribution network<sup>5</sup>.

This concerns a whole range of services important for the reliable operation of power transmission and distribution systems:

- Load-frequency control in the power system.
- Long-term power reserve.
- Voltage and reactive power control.
- Restoration of power supplies after a breakdown of the system.

The provision of these additional services by independent power producers including the operators of CHP plant is not so widespread in the Czech Republic and the prices of these services have not yet been established. It is important that fair and transparent rules are implemented. A collective approach should be applied, which allows for the bundling of CHP projects in the assessment of the impact of CHP on the system.

#### *Actions - Standby and top-up charges*

1. 2000: The Energy Regulatory Office (ERO) will draw up a draft decree on regulated tariffs for standby charges.
2. 2000: ERO will draw up a draft decree on regulated tariffs for top-up charges.
3. 2000: ERO will develop rules for the compensation for network services of IPPs.

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<sup>5</sup> Even at present, some power distribution companies offer a special tariff to CHP plants if they may supply power in peak hours. In general, there is a trend to use CHP plants that are connected to individual power distribution systems for load management.

## 6.2.2 Heat

The method of heat pricing used in the past few years distinguishes between two categories of heat consumers: households and other consumers. Concerning heat supply to households, the usual buyer of heat is an operator of the housing stock or an owner of a tenant house. Direct heat price subsidies were abolished in 1998 and replaced by an objective-regulated (cost-wise) heat price set according to a new methodology.

The current Czech energy legislation clearly stipulates that the holders of heat distribution licences are obliged to purchase heat from combined heat and power production whenever it is technologically feasible. The price, which is set according to the provision of § 18 of the Energy Act (Act No. 222/1994), point 4, is subject to price regulations, which means that the price for electricity from CHP plants should be fixed by the Ministry of Finance. The development of regulated prices for heat after the year 2000 is still not clear. The Ministry of Finance proposes to maintain the current objective-regulated pricing with the annual growth rate of heat price of 3 to 6%, depending mostly on the development of fuel prices.

The prices of heat from CHP plants result from calculations carried out by the producers and are highly dependent upon the cost distribution between heat and power production. No uniform and generally recognised method exists for a precise distribution of costs between the two products. The new Energy Act will preserve the obligation of the holders of licences for heat distribution to purchase all heat from CHP production. The heat source owner is obliged to cover the justified costs of connection to the heating system. This obligation is not binding if:

- heat demand is met by other sources of heat of the same type,
- the obligation would lead to an increase in the total price of heat, or
- parameters of heat carriers are not compatible with parameters of the distribution system in the point of connection.

For the new competitive energy market, a new approach to heat pricing and the implementation of new rules and methods of the heat sector regulation are proposed. The current approach to setting an objective-regulated heat price would be maintained as a basis for setting the price ceiling that suppliers cannot exceed. Heat producers and suppliers would calculate their heat prices from the costs of individual links of the whole chain covering heat production, transmission, distribution and supply to end users. The heat price for end users should be based on cost calculation. Cross subsidising among different groups of end users would not be allowed. End users should be allowed to choose between a single-component and a two-component tariff. The Energy Regulatory Office, which will be established under the new Energy Act, will supervise the pricing process. Heat demand influences power generation, regardless of some heat storage used to maximise power generation potential during peak periods. Most CHP plants are designed to meet industrial or municipal heat demand, so the heat purchase obligation is not a problem; heat distribution companies are obliged to purchase heat from CHP plants.

### *Actions - Heat price and tariff regulation*

2001: Given the local character of heat supply, the heat market will not develop fully. In the transition period, the regulation of heat prices should be ensured to protect end users from the monopolistic behaviour of heat suppliers and heat pipelines owners. The Energy Regulatory Office will draw up a draft decree on heat prices based on the objective-regulated price.

### 6.2.3 Fuel

#### *Solid and liquid fuel*

Solid fuel prices, both for fossil fuel and for renewables, are not regulated and their regulation is not likely to be introduced in the future either. The same applies to liquid fuel prices.

#### *Natural gas*

Natural gas prices are regulated. On 1 January 2000, a new gas tariff system was introduced. The new tariff system is based on proposals by the regional distribution companies and an analysis of their actual costs incurred in gas supply to specific customer categories. The new system introduced a broader categorisation of end users-large-scale customers, medium-scale customers, small-scale customers, and households. The last two categories are further subdivided into three groups by their annual gas consumption. When subsidies to domestic prices will be removed, the two categories should merge. The only criterion for inclusion into a certain category will be the customer's total annual consumption.

The fixed monthly charge for large customers will depend on the daily maximum volume contracted. The new tariff system has introduced seasonally differentiated prices for the periods from April to September (summer price) and October to March (winter price). Seasonal prices will be used between Transgas and regional distribution companies, and for sales to customers with consumption of 60,000 m<sup>3</sup> and above, i.e. medium-size and large-size customers. The level of differentiation depends mainly on the costs of natural gas storage. It is envisaged that in 2000 a scheme of the three-month periodicity of natural gas price adjustment will be introduced to make possible a more flexible response to gas purchase price volatility on world markets. Since 1 January 2000, natural gas is traded in kWh.

The Czech Republic's position paper submitted to EU representatives contains some key commitments. As from 2001, a new Energy Act is to be in force, in 2003 Transgas's import monopoly is to expire, and between 2005 and 2008 the Czech gas market is to be gradually opened to meet the Gas Directive's requirements. The new Energy Act as proposed already respects most of the Gas Directive's provisions. An exception is a transition period the country applies for, concerning gas market opening which should be executed in two stages as can be seen in the following table.

Table 6.2 *Major steps proposed for opening the gas market in the Czech Republic*

Date	Consumer capacity (single meter) [mln. m <sup>3</sup> ]	Milestones
January 2001	-	New Energy Act in full power
January 2003		Eliminating subsidies
January 2005	>25	20% of gas market
August 2008	> 5	33% of gas market

After 2002, a transparent gas pricing structure will be created, which will make it easier for eligible customers to choose their energy suppliers. The natural gas price for Czech customers is to be composed of the gas purchasing price on the Czech Republic's border and the price of the services required: transport, distribution or storage.

The opening of the gas market in the Czech Republic is likely to be followed by a drop in gas prices for large consumers, as is the case in the UK. In the first phase, the opening of the market will concern only large power plants including CHP plants. Only in the second phase also small and medium-size plants will be involved. This situation will worsen the competitiveness of these plants. To solve the problem, the period between the two phases of the market opening should be minimised or fair competition ensured by other measures.

## 6.2.4 Conclusions

The proposed programme of adjustment of energy prices charged to end users should be fully implemented to reflect real economic costs, introduce fair competition among individual energy carriers on the market and improve the competitiveness of district heating. Finalisation of the process of adjustment of energy prices for end users is a necessary precondition for accession of the Czech Republic to the EU and for the opening of energy markets. This move cannot be postponed any longer. The introduction of new end-user energy prices should be accompanied by setting new end-user electricity, gas and heat tariffs that would reflect the time, season, volume and required reliability of energy supply. In general, electricity, gas and heat tariffs would be set as two-component or single-component tariffs to enable consumers to choose their suppliers.

Establishing clear and transparent rules for tariff setting should be the main task of the Energy Regulatory Office rather than the approval of individual tariffs. At the same time, an uniform heat price/tariff should be established in each district heating system for small-scale heat consumers (households, SMEs). These tariffs should be published to be available to any customer. Large consumers should pay negotiated tariffs; however, cross-subsidies should be eliminated. Given this, a strong supervising role of the Energy Regulatory Office will be needed, at least in the transition period.

The current regulations under which power and heat distribution companies are obliged to purchase all the power and heat produced in CHP plant reflect the strong regulation of the energy market. This practice cannot continue to the full extent in the future. The current rules of feed-in tariff setting for electric power purchased from CHP plant at a regulated tariff are not in favour of CHP if new CHP plants have to compete with old coal-fired power plants or nuclear power plants. More favourable conditions can be negotiated with power distribution companies if there is a need for power supply in peak hours.

Opening up the electricity and gas markets as required by the EU Directives will be a key step which can substantially influence, in a positive or a negative sense, the future development of the market for CHP because:

- Opening competition can lead to a power price drop for some categories of end users, mainly large consumers who take electricity from high voltage or very high voltage grid, and thus reduce their interest in the construction of own CHP plants.
- General fall in consumer prices might trigger pressure for reduction in feed-in tariffs charged to IPPs and thus reduce the profitability of new projects.
- The uncertainty about the future market development (volatility of fuel-input prices for CHP plants or purchase prices for electricity) will make long-term planning difficult and, in consequence, discourage many potential investors from investing in CHP.
- Low electricity prices in the spot market may result in the outage/closing of some CHP plants.
- The gradual opening of the electricity and gas markets for different categories of consumers and suppliers could cause unfair competition between different categories (according to their capacity) of electricity generators, CHP included.
- Free competition will ease the access of IPPs to the grid and enable them to negotiate the price, especially if they can offer ancillary services.

The market opening should be regarded as a challenge for CHP plant operators. They could offer a whole range of important services needed for ensuring security of power transmission and distribution system operation, that is, for safe and reliable supply of electricity to consumers (reliable delivery and high quality of power). This could substantially improve the economic viability of many CHP projects. The provision of ancillary services by independent power producers including the operators of CHP plant is not so widespread in the Czech Republic and the prices of these services have not yet been established.

The EU Directives do not explicitly mention opening the heat market. Nevertheless the heat market is very important in the Czech Republic even if it is of regional character. Opening the electricity and gas markets will strongly influence also the heat market. While regulation at the national level is assumed in the draft new Energy Act, there are views that, given the regional character of heat supply, the district heating regulation could be organised at a regional level. This issue may be of crucial importance for the future development of CHP and, consequently, should be dealt with very carefully.

The protection of the global, national and regional environment will be given even higher priority. In this process CHP production can play a positive role as a more environmentally friendly technology compared to the separated production of power and heat. This process will take long time though. In the meantime, fiscal measures should be implemented to promote energy efficient and environmentally friendly technologies like CHP production. Some of these measures are discussed in the following chapter along with proposals of the priorities.

## 6.3 Taxes, levies and charges

### 6.3.1 Value Added Tax (VAT)

In 1998, most of VAT exemptions on energy carriers were eliminated and a general VAT rate of 22% has been applied since. Exemptions remain for renewables (primarily for biomass) and heat from district heating systems that are charged with a reduced VAT rate of 5%. The Czech VAT rate should be harmonised with the EU standard. For electricity, the basic VAT rate is applied. The Czech Government intends to apply for a derogation from the general VAT rules and maintain the current reduced VAT rate for renewables and heat from district heating. If the derogation is not granted, the price of heat in district heating would rise by 16.5%. This may substantially influence the competitiveness of district heating compared with local heating using natural gas and thus reduce future potential for CHP development.

### 6.3.2 Levies

No special price/tariff incentive is available for CHP plants although CHP technology is more environmentally friendly than the separate production of power and heat. The general goal should be the internalisation of external costs, which is a long-term process. In the meantime, the introduction of a scheme that would impose levies on less environmentally friendly technologies should be promoted by the Government.

The draft Energy Management Act, which was approved by the Government in December 1999, includes one of the policy measures that could help to promote CHP, the so-called 'green cent' (or 'green levy') scheme. The scheme would introduce a levy of 1 haler/kWh (0.03 Euro/kWh) applicable to all electric power delivered to end-users. The levies would constitute revenues to the State Environmental Fund and would be used for the support of energy efficiency and renewables projects. However, the draft Energy Management Act does not specify the method of developing the yearly programmes of energy savings and promotion of renewables. In addition, the proposed scheme involves only one energy carrier (electricity) thus discriminating it against other energy carriers in the market. Imposing a levy is a non-system measure and therefore it should be in force only for a short-term period, followed by the introduction of another suitable instrument (see hereinafter).

### 6.3.3 Emission charges

In the Czech Republic different air pollution charges are set for large and medium-size emission sources, and for small sources (Clean Air Act No. 389/1991). The current Czech scheme of emission charges has the following shortcomings:

- Sources of air pollution operated by natural persons (non-entrepreneurs) with thermal output up to 50 kW remain uncharged.
- The current rate of charges is insufficient and should be increased. Charges do not yet equal external pollution costs nor do they consistently provide a sufficient incentive for polluters to take abatement action.

Emission charges in the Czech Republic cannot be compared with emission charges in EU countries, both in terms of their rates and the range of emissions types involved. Therefore, the impact of possible future increase in emission charges should be first compared with the option of environmental tax implementation. In general, the following two options are possible:

- Parallel existence of both emission charges and the environmental tax.
- Replacement of the current emission charges scheme by an environmental tax scheme.

An analysis shows that the environmental tax scheme should be given priority<sup>6</sup>.

### 6.3.4 Energy/carbon tax

In the European Union and the Czech Republic, energy or carbon taxes are being discussed as a new instrument in environmental policy. The taxation of energy carriers on the basis of their carbon content (carbon tax) will improve the economic effectiveness of energy efficiency measures and of renewables generation, and will therefore promote their faster market penetration. However, it is important that the impact of this taxation is carefully assessed prior to its introduction. A number of proposals on the introduction of such a tax has been considered but any political decision has not yet been taken. The time horizon of the tax introduction, even an approximate one, has not yet been set. The method of setting the tax rate is also lacking. However, both the time horizon and the tax rate are very important information for investors.

A study has shown that the introduction of a carbon tax would lead to a significant increase in the share of CHP in the period before 2030<sup>7</sup>. The introduction of energy or carbon taxes is recommended on the long-term. The tax revenue will be recycled back to the economy by lowering social insurance payments and other levies and taxes. The tax rates can be established at values recommended in a study carried out for the Ministry of the Environment<sup>8</sup>.

#### *Actions - Taxes, levies and charges*

1. 2000: The Czech Government will apply to the European Commission for a derogation from the general rules regarding a single VAT rate in order to maintain the current reduced VAT rate for renewables and heat from district heating.
2. 2000: The Government will draw up the energy levy scheme (green cent scheme) in more detail. The attention will be focused on rules for using the gained financial means for the support of energy efficiency including CHP because the scheme suggested in the draft Energy Management Act is not satisfactory. The possibility of applying the energy levy scheme to other energy carriers should be considered with a view to avoiding the distortion of fair competition.
3. 2000-2001: The Government will set the targets and the necessary steps to implement the energy/carbon tax in the Czech Republic taking into account the ongoing process in this field in EU countries.

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<sup>6</sup> Update of the analysis of the impact of the environmental tax reform on households and entrepreneurs. IEEP, Prague, 1999.

<sup>7</sup> Development of integrated energy-environment scenarios Czech Republic. ECN, Petten, 1999.

<sup>8</sup> SRCI CS: Evaluation of the Impacts of an Ecological Tax Reform, Prague, 1997.

4. 2000-2001: The Government will prepare the strategy of future modification of the emission charges scheme. The current rate of charges is not sufficient and should be increased. The charges do not yet equal external pollution costs nor do they consistently provide sufficient incentive for polluters to take abatement action. At the same time, the modification of the emission charges scheme should be harmonised with the introduction of the energy/carbon tax.

#### 6.4 Licensing for combined heat and power production

Electricity supply licences are essential for the promotion of CHP. Chapter 3, article 6 of the EC Electricity Directive states that *'it must be possible for autoproducers and independent producers to obtain authorisation, on the basis of objective, transparent and non-discriminatory criteria'*. The current Czech Energy Act stipulates that anyone wishing to do business involving the production of energy for sale to third parties must have authorisation. The authorisation is granted by the Ministry of Industry and Trade for a period of 25 years. The draft new Energy Act introduces a term of 'licensing'. As for a CHP plant, two licences have to be obtained-for electricity generation and for heat production, separately. Licensing combined heat and power production could be a barrier only if the charge paid for a licence is high and/or if the bureaucratic procedures are lengthy. The draft new Energy Act stipulates free-of-charge licensing.

##### *Actions - Licensing*

1. 2001: The Energy Regulatory Office will prepare a decree on licensing heat and power production on the basis of non-discriminatory, transparent and objective criteria and free of charge.

#### 6.5 State authorisation for the construction of CHP plants

The draft new Energy Act introduces state authorisation for the construction of generating capacity. As for a CHP plant, two authorisations have to be obtained: 1) for electricity generating capacity (of 30 MW<sub>e</sub> or higher, in total) and 2) for heat generating capacity (of 30 MW<sub>t</sub> or higher, in total), separately. As for the construction of CHP plants, clear rules for the granting of authorisations have to be laid down as a right to obtaining authorisation is not considered in the draft new Energy Act. In this respect, the following stipulations, among others, of the draft Act are of crucial importance: any CHP project must be in accordance with the regional energy planning and the plant has to use local or indigenous fuel or other energy sources.

##### *Actions - State authorisations*

1. 2000: MIT will prepare a decree on the granting of state authorisations for the construction of CHP plants on the basis of non-discriminatory and transparent criteria. Preconditions for granting the authorisation will be clearly specified in the decree.

#### 6.6 Environmental regulation

CHP projects in general, but not all of them, have a positive environmental impact. New CHP plants that only partly replace the output from existing coal-fired CHP plants or heating plants may not produce expected reductions in emissions. When plant loading decreases and fluctuations in demand increase (due to the fact that CHP plants are baseload plants), the environmental impact of the coal-fired plant may worsen. A regulation should be drawn up under which the environmental implications of any specific CHP project would be examined and evaluated in case the initial coal-fired plant is retained. The following environmental legal regulations are applicable to two different phases of CHP projects:

- For plant construction – Act No. 244/1992 on environmental impact assessment, which clearly stipulates the methods of the assessment of the new technologies impact on the envi-

ronment; this assessment is to be carried out as a prerogative for granting a planning permission / plant operation permission.

- For plant operation – primarily Decree No. 117/1997 issued by the Ministry of the Environment, which sets the emission limits and other conditions for the operation of stationary sources of pollution and for protection of the environment. This Decree provides a list of air pollutants, specifies the categories of stationary sources of pollution and technical conditions of their operation, requirements on monitoring air pollutant emissions and requirements on the quality of fuels.

Key Czech environmental regulations need to be harmonised with EU legislation. Primarily it concerns the implementation of EU Directive No. 96/61/EC on IPPC (Integrated Pollution Prevention and Control) and, secondly, the tightening of the limits of emissions of certain pollutants into the air from large combustion plants, especially of nitrogen oxides. A new EU Directive on that issue is currently under preparation as an amendment of Directive No. 88/609/EEC.

#### *Actions - Environmental regulation*

1. 2000-2001: MoE will ensure the harmonisation of Czech environmental regulations with EU legislation, especially as regards tightening of the limits of emissions from large sources.
2. 2001: MoE will prepare a programme of implementation of the IPPC Directive in the Czech Republic. As the provisions of the Directive relate to sources with heat output of more than 50 MW, they will have a significant impact on CHP plants.

## 6.7 Energy Act

The Energy Act will provide a legal framework for the energy policy (see Figure 4.1). The new Energy Act will be probably adopted before the end of 2000 and come into force in January 2001. The Act regulates the trading in energy carriers, including the steps towards a liberalised energy market. It defines the role of energy utilities in the field of the promotion of renewable energy and energy efficiency, including priority access to the grid for power and heat from CHP and renewable energy and/or the obligation of the purchase of heat.

As for the access to the electricity grid, the Act should include provisions concerning the following issues. The general aim of these measures is to ensure that electricity supply companies well found and dully substantiate the charges:

- Minimisation of licensing costs and the term of approval procedure.
- Minimisation of access costs for <500 kW<sub>e</sub> CHP plants.
- Either setting of a fixed feed-in price or requesting each electricity distribution company to publish information explaining their methodology for assessing feed-in prices.
- Ensuring transparency of the calculation of electricity standby charges (at the regional level).
- Ensuring transparency of the calculation of electricity top-up charges (at the regional level).
- Developing a transparent methodology for the priority dispatching of CHP plants based on overall thermal efficiency, particularly for the summer period; no economic disadvantage should result from such a dispatching mechanism.
- Provision of a means of appeal by customers to the Energy Regulatory Office when charges are considered to be unfair.

In terms of heat, the Act should contain provisions for:

- Transparency of the costing of heat for individual types of plant.
- Guidelines for the setting of contractual minimum and maximum volumes of heat consumption.
- Drawing up a methodology for the calculation of the separation of heat and electricity costs (needs discussion with stakeholders).
- Provision of a means of appeal by customers to the Energy Regulatory Office when charges are considered to be unfair.

#### *Actions - Energy Act*

1. 2000: MIT in co-operation with MoE will incorporate the above principles into relevant decrees.
2. 2000: MIT will finalise the new Energy Act so that the Act can be adopted in 2000 and come into force in 2001.

## 6.8 Energy Management Act

The draft Energy Management Act specifies the rights and obligations of natural and legal persons in production, transmission and consumption of energy, leading to more efficient use of energy in the Czech Republic and to environment protection, stimulating a reliable energy supply, competitiveness and sustainable development. The Czech Government furthermore states that the free market does not provide guarantees for an efficient use of energy and environmental protection. Therefore, additional regulation is required. In December 1999, the draft Energy Management Act was accepted by the Czech Government and submitted to Parliament. This version of the Act contains the following main provisions relating to CHP:

- Obligation of energy audits in organisations with a certain energy use and source capacity. Exact rules for auditing will be laid down in decrees. Organisations in the public sector have an obligation to implement the audit results. However, the respective funding scheme has not been arranged. Individual sectors are expected to cover the costs of both the audit and its implementation.
- Obligation of energy audits on energy efficiency of all existing CHP plants with a certain volume of annual energy consumption specified in the Act.
- Obligation of an audit on the cost effectiveness of CHP when an application is submitted for a building permit for the construction of a new / rehabilitation of an existing installation that produces heat or electricity only, without CHP. Under the Act, the CHP scheme is to be applied when the outcome of the audit is positive and the long-term purchase of power and heat are ensured. The obligation to check the viability of CHP scheme application holds for all plants of thermal capacity higher than 5 MW<sub>t</sub> and also for electricity generating plants of total installed capacity higher than 10 MW<sub>e</sub> (steam turbines), 2 MW<sub>e</sub> (gas turbines), and 0.8 MW<sub>e</sub> (gas engines).

Within the EU, no legislation is in force at the moment comparable with the proposed mandatory auditing and the CHP obligation stipulated by the Czech draft Energy Management Act, but EU legislation does allow to impose an obligation of CHP application. However, imposing an obligation as a key instrument for the promotion of CHP is not in line with the EC guidelines for CHP promotion as formulated in the Community Strategy to promote Combined Heat and Power (1997). EU experience has shown that CHP is not likely to be effectively promoted by the use of one single instrument. A comprehensive policy, involving a range of instruments, each addressing different barriers, is needed. Furthermore, a CHP obligation is difficult to impose in a liberalised market because it is not in accordance with market principles. In the Czech Republic, a priority should be given to the development of a comprehensive policy of energy efficiency, in particular CHP, which would lay down targets and specify a combination of instruments to achieve them, regulatory measures among them. Such approach would be in compliance with the Energy Charter Treaty.

The main barriers to CHP development have been discussed in Chapter 5. It has been concluded that the most serious obstacles are the following: gas and electricity prices; economic viability of schemes, and access to capital on acceptable terms. These obstacles are not addressed in the draft Energy Management Act. They should be dealt with in the Energy Policy document.

A key area of concern in the Czech Republic is CHP efficiency. Energy audits should be enforced as a means of the verification of the technical feasibility and economic viability of CHP projects. Some formalised specification of the results of these audits will be very useful in standardising the Government's approach to this issue. A standardised methodology for the calculation of the IRR (internal rate of return) of CHP projects also needs to be developed. This methodology should take into account all the operating cost components allowing the Government to fix minimum IRR values for different types of plant.

*Actions - Energy Management Act*

1. 2000: The Ministry of Industry and Trade (MIT) will follow the process of the Energy Management Act approval by the Parliament and the Senate.
2. 2000: The measures for CHP promotion will be incorporated into the CHP Action Plan as part of an overall CHP promotion policy.
3. 2000: MIT will ask the opinion of the European Commission and international CHP promoters, in particular COGEN Europe, on the regulatory measures regarding CHP.
4. 2000: MIT will lay down a proposal for the specification of audits and for the methodology of calculation of the IRR for different types of CHP plants.
5. 2000: MIT will assess the impact of the Energy Management Act regarding auditing and CHP obligation with the focus put on CHP implementation barriers and costs.
6. 2001-2005: After the Energy Management Act comes into force, MIT will monitor its impact on CHP development on a yearly basis.

## 7. FINANCING OF CHP PROJECTS

### 7.1 Introduction

The wide range of technical designs and applications of CHP schemes results in a wide range of methods of financing. The financing structures of a CHP plant will show fundamental differences, depending on the individual features of the project. The following finance is available for energy investments: 1) in-house capital (own capital sources), 2) Grant financing incl. international preferential loans, 3) loans from international financial institutions and 4) commercial loans. Third-party ownership participation can also ease the access to loans, 1) entry by a strong investor, 2) Energy Service Companies (ESCOs) involvement, and 3) leasing.

Especially for CHP investments the net profit, depreciation, loans, to a limited degree grants and third-party financing are the major financing sources used when the decision is made on investing into modernisation of the heat /and power sources and networks. Most industrial energy utilities and all district-heating systems in the Czech Republic are in the hands of private owners or municipalities and have to rely on the capital from the market for new investments. The bigger the CHP plant, the more likely the use of the „project financing,, (Energy Performance Contracting)<sup>9</sup> methods involving high costs of development due to their complexity. At the same time, also projects implemented by independent energy producers (e.g. industrial enterprises) will use project financing structures more frequently since industrial enterprises have a strong interest in preventing investments into ‘auxiliary operations’ (as is the energy supply of a company) from taking effect on the balance sheet. Also outsourcing has become very popular (mainly after production drop) and many big industrial companies have sold their energy utility. EPC in industry has only been developing. Smaller industries and the DH systems CHP installations are mostly financed by Czech commercial loans and soft loans available. In DH reconstruction third-party finance/ESCOs have been becoming more and more popular. For small-scale CHP investments mostly in-house capital is being used, mainly if supported through state grant sources.

From the financing point of view, to improve access to existing sources of finance at least in case of projects that might proven to become financially viable under existing conditions, it seems fit to strengthen the project development phase. This would assist in addressing barriers such as the lack of in-house capital, lack of technical expertise, lack of information on existing alternatives, lack of economic skills and knowledge on efficient strategies leading to risk minimisation. This is fully true also in improving access to the state financial support.

### 7.2 State support

In addition to EU programmes provided in recent years, state support programme for energy efficiency for 2000 includes extended support to CHP schemes. It provides grants, combination of a grant and a soft loan, soft loans and guarantees to all types of investors. The state support can be complementary to all other financing options and definitely is the major incentive for CHP implementation in smaller and medium sized applications.

Co-financing has been provided by the Government:

- Directly from the state budget (allocated by the Czech Energy Agency- CEA).
- From the State Environmental Fund (SEF) resources (revenues from fines for air pollution).

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<sup>9</sup> A way of energy efficiency management and funding – the initial investment is paid back by future avoided costs of energy.

Soft loan schemes have been provided by:

- The State Environmental Fund.
- Phare Energy Saving Fund.
- Phare Business Environmental Programme.
- IFC (International Financial Corporation).

The existing programme of the State Environmental Fund of the Czech Republic offers a combination of a direct subsidy and a soft loan for small and medium-sized sources, i.e. up to 5 MW of installed heat capacity-the conditions of which are for private investors nearly comparable with commercial financing. Public entities in the Czech Republic are supported by extended access to direct subsidies for CHP installations and also the conditions of soft loans are more favourable in a lower interest rate. This is in line with the recent energy efficiency policy of the Czech Republic. All these programmes have been designed to support air protection and energy efficiency in general and require considerable reduction of emissions and energy savings to be achieved. This is achievable mainly in substitution of coal by gas but difficult to achieve by all CHP applications.

### 7.3 Conclusions and recommendations for financing CHP projects

- In the Czech Republic the problems associated with financing CHP investments in both district heating systems and industrial utilities *is not the lack of capital*. More important is the *disproportion* between the expectations and requirements of the private financiers (i.e. conditions of financial sources availability), on one hand, and economics (financial viability) of the CHP alternatives compared to heat-only solutions, on the other hand. Nevertheless, many CHP projects have been financed. Especially for small and medium-sized CHP investments the net profit, depreciation, loans, to a limited degree grants and third-party financing are the major financing sources used when the decision is made on investing into modernisation of the heat and power sources and networks.
- The project development phase (incl. detailed business plan) is often underestimated (both in time requirements and the related costs) by those who intend to invest in heat source reconstruction or building.
- Fiscal measures that are directly influencing economics (revenues) of CHP schemes should be prioritised by the state against investment support, because they are „market productive,, and non-discriminatory. These may include either *fixed feed-in tariffs* for CHP producers, diversified according to the power installed capacity or *tax deductions* for CHP technology producers, and for companies producing electricity and heat in a CHP unit. In case of fixed feed-in tariffs, the state support should provide for reimbursement of distribution companies for the fixed feed-in tariffs to keep the competitive environment for them fair.
- The direct investment support is selective and hence ‘not market fair’, mainly in case of private investors. Yet it has proven as efficient tool for CHP promotion mainly in case of small CHP installations, financed from in-house capital. Maximum transparency needs to be maintained in the overall scheme to make the selection of projects and the decision making process easier.
- Long-term loans (at least 7 years) with preferential interest rate that would allow to repay the CHP investment without significant increase of heat price and threatening the competitiveness of heat on the market seem to be the best way of financing in municipal district heating systems in addition to third party finance, in case it is providing similar advantages.
- The conditions of commercial loans have improved. On the basis of a well-prepared project proposal, banks are able to offer much better conditions than in recent years-a lower interest rate (even below 10%) and longer repayment conditions.
- The Phare Energy Saving Fund has recently approved a loan for CHP installation of 5.5% interest rate with 6 year repayment period. Should the fund sources be increased, it might become a convenient source of soft-loan finance for more CHP installations.

- The obligation of CHP installation in case the audit proves minimum IRR level (expected to be introduced by the new Energy Management Act) will have a substantial impact on investors' decision-making on the allocation of funds for CHP plants. This regulatory measure should be linked with the support for investment.

#### 7.4 Role of the Czech Government

The role of the Czech Government should mainly consist in removing barriers that deform the market for CHP and facilitate financing of CHP projects through the following measures:

- Reduce the external risk to CHP investments, i.e. introduce of cost-based pricing and thus remove unfair competition environment for heat supplies.
- Alleviate the market risk, i.e. support the creation of transparent conditions of setting feed-in tariffs for electricity sales, improve heat tariff structure, improve enforcement of non-payments for heat, support introduction of long-term delivery contracts on heat.
- Reconsider the obligation of CHP implementation in case of private subjects and its possible linkage with the support of investment through motivating instruments.
- In case of public subjects, the state should take over or alleviate the extra-investment cost for CHP alternative through clearly specified rules, depending on the economics of a specific investment, in addition to other factors.
- Continue support (in 1999 improved significantly) to CHP installations, mainly through soft-loan schemes. The state should set up clear rules for the direct support, depending on the economics of the CHP installation as well. A specific programme should be introduced after the „obligation for sources of 5 MW of installed heat capacity, in the public and state-owned sources.
- Support should be also given to continued operation of the Phare Energy Saving Fund. This fund is revolving, fully market compatible scheme, but without further state/EU contribution the amount of available funds for investments is very small.
- To improve access to commercial funding and to SFZP funds promotion of the necessity of the project development phase and the necessary extent of economic and financial expertise should be enhanced.
- To host more JI projects, the Czech Republic needs to develop its own JI strategy, especially because the country's role as a host to JI projects may be limited in the future. The Ministry of the Environment, which is responsible for Activities Implemented Jointly/Joint Implementation, operates a JI registration centre. MoE, however, needs to adopt a JI strategy as a follow-up to the National Climate Policy, which has been negotiated by the Government on May 17, 1999. This strategy could be based upon strategic variants proposed by the National Strategic Study for JI (National Strategic Study for JI in the Czech Republic, World Bank, 1998) and upon the results of a follow-up study carried out in 2000.

##### *Actions - State financial support*

1. 2001: Multi-annual financing & Multi-annual programmes will be developed by the Czech Energy Agency (CEA). The financial support to CHP should be based on transparent criteria, based on detailed investment appraisal. This is difficult to perform within the time given for submission of applications to CEA. Multi-annual programmes are more appropriate for this type of support, which is not conformable with existing financial rules for the state budget funds, but allowed for non-budgetary sources of the State Environmental Fund. New financial rules, though, are under preparation that will probably enter into force in 2001 and improve the situation..
2. 2001: Transparency and access to state support will be improved (CEA). A clear set of criteria for project submission and project selection will be developed, in which the share of direct support would be known in advance.

##### *Actions - EU funded Programmes*

1. 2000: In all these programmes co-financing from the state budget at the level of at least 25% will be required from 2000 if any additional contribution should be allocated by the

Commission from the Phare programme. To keep the Phare ESF and BEP running, the responsible ministries will have to allocate these funds as their priority financing tools, include them into the relevant sectoral operational programmes and ask for support from state budget

*Actions - Joint Implementation*

1. 2000: The Ministry of the Environment will develop a strategy for JI, as well as an administrative framework to handle JI projects. The costs for development of the framework are estimated at CZK 2 million.
2. 2000-2005: The Government, in particular the Ministry of the Environment, will be more active in finding Czech and foreign partners to be engaged in JI projects.
3. 2000: An information campaign (conferences etc.) will be prepared and implemented by the Ministry of the Environment for both domestic and foreign institutions interested in CHP project funding. The budget is estimated at CZK 2 million.

## 8. OTHER MEASURES

### 8.1 Information and awareness

Many potential users and possible investors are not fully aware of the advantages of CHP, in particular of small-scale CHP. Therefore, providing information on CHP and raising awareness is an crucial component of the CHP Action Plan. In the Czech Republic, a nation-wide information campaign on energy conservation has not been carried out since 1990. On the short term, an information campaign for small-scale CHP should be launched. The information campaign should focus on best practice CHP technologies and projects in the Czech Republic. Key stakeholders in the field of CHP, particularly the Association for District Heating, COGEN Czech Republic, the Czech Association of Employers in Energy Sector and the Czech Gas Association, and branch organisations in industry and the service sector should be involved in the information campaign. The activities of all these organisations in the field of CHP should be co-ordinated. CEA and SEF should also participate in the information campaign by presenting their experience in CHP project support. The Czech Energy Agency has created a network of Energy Consultancy and Information Centres (EKIS) throughout the country. Other existing information centres are not co-operating (organisations of small and medium-sized enterprises, environmental NGOs, etc).

For industry, CHP is an important technology for energy efficiency improvement. The Energy Efficiency Action Plan recommends to focus energy efficiency policy in industry in the short term on providing information and raising awareness, and reducing the transaction costs by providing financial support to feasibility studies and project development in the form of subsidies and expertise. CEA should play a prominent role in these activities.

#### *Actions - Information and awareness*

1. 2000: The CHP Action Plan developed by the Ministry of Industry and Trade will include a strategic awareness and marketing plan for CHP. This plan should cover all target groups and use a wide variety of instruments. Utilities will also play a role in information dissemination to the public. The budget necessary for the development of such a plan is about CZK 2 million.
2. 2000-2005: The tasks of the EKIS centres and the support of their activities will be based on the strategic awareness and marketing plan. A better regional distribution of these centres will be arranged, providing easier access to their services in individual regions.
3. 2000-2001: CEA will investigate the possible overlaps and synergies between the EKIS network and other existing information centres, and will take action accordingly. This will reduce the costs of running the consulting system.
4. 2000: The web sites of the Czech Energy Agency (CEA) and the State Environmental Fund (SEF) will be extended to include information on the benefits of CHP, project development cycle, external assistance available, funds available, etc.
5. 2001-2010: CEA will provide detailed information on successful CHP projects, on companies involved in the project development phase, design, installation, third-party financing, and EPC through an easily accessible information network. The information should allow for a detailed reference list, i.e. for the possibility to verify the information on the qualification and experience of investors with companies. Basic commercial data and ownership structure available on the Internet should be extended. Partners should be involved-e.g. Union of municipalities, to give relevant advice to their members.
6. 2001-2010: MIT and MoE will promote energy management at the municipal level and the development of municipal energy concepts, on the basis of which municipal heat supply plans can be prepared.

## 8.2 Standard contract and standardised projects for small-scale CHP

The large overhead costs for the development of small CHP projects and the necessity to conclude power purchase contracts are the main barriers. These can be reduced if standardised projects and a standard contract for small-scale CHP are prepared. The standardised projects would include rules for the preparation of CHP projects of various types and capacity, including rules for submitting applications for funding from various sources (commercial sources and grants), information about planning procedure, licence and authorisation granting, etc. The standard contract would include conditions of electricity pricing and of setting transmission and distribution/transportation charges, standard conditions for grid connection and standard legal clauses. Experiences in France and Spain have demonstrated the benefits of such contracts.

### *Actions - Standard contract and standardised projects*

1. 2000: MIT/ERO/CEA, in co-operation with design and consulting firms and companies/associations in the heat sector, will prepare standard contracts for small CHP run by IPPs, and promote their use, e.g. through the EKIS centres.

## 8.3 Tradable Green Certificates (biomass-fired CHP)

To realise environmental targets in a liberalising market the design and implementation of policy measures and incentive schemes have to be in accordance with free market principles. Current incentive schemes, most of which have been established in the pre-liberalisation situation, might not be able to fulfil this requirement. This underlines the need for new policy measures that are more in coherence with the new market environment. The major characteristic of a green certificate system is that electricity produced by renewable sources is certified. These certificates have two purposes. First, they can serve either as an accounting mechanism in case obligations set by the government have to be met, or as a proof to customers of green electricity that a certain amount of renewable electricity has been produced. Second, green certificates facilitate the creation of a green certificate market that functions independently from the market of electricity as a commodity. In the European Union, this instrument is being discussed and is already implemented by some Member States. The Czech Republic should consider the introduction of tradable green certificates in renewable energy policy as a part of the approximation process to EU policy.

### *Actions - Tradable Green Certificates*

1. 2001: MoE in co-operation with MIT will analyse the tradable green certificate scheme applied in EU countries and will make a decision on a pilot project to be developed in the Czech Republic.

## 8.4 Emission trading

The climate change is one of the major global environmental, economic and social concerns. To reduce possible future risk of global climate changes it is necessary to find a common approach to GHG emission reduction. Successful reduction of GHG emissions without limitation of the economic growth will require innovative and flexible approach. One such approach is emission trading (ET) which has already been used on the national level in some countries to reduce emission of selected pollutants (e.g. SO<sub>2</sub>), and also in pilot project in case of GHG emissions.

In March 2000, the European Commission has presented a Green Paper on GHG emissions trading, COM(00)87. The paper opens a discussion on trading system inside the EU to be launched by a target date of 2005, three years before entry into force of an international regime. According to national reduction plans, companies would be allocated quotas for their emissions. Companies emitting less than their quotas can sell their surplus. The scheme should be related to large point sources of CO<sub>2</sub> in the following sectors: electricity and heat production, iron and

steel, refineries, chemicals, glass, pottery and building materials, cement, and paper and printing.

Conceptually, ET within the European Union could be set up in several ways with varying degrees of the Community intervention<sup>10</sup>. These differences could range from a Member State based scheme to a harmonised EU-wide trading scheme in which the design and regulation is laid down at Community level. From the future promotion of CHP production ET can create a new source of co-financing through selling the surplus of emission quota when switching from a separate heat and power production to CHP production with higher efficiency and thus lower fuel consumption and GHG emissions.

#### *Actions - Emission Trading*

1. 2001: MoE in co-operation with MIT should analyse the emission trading applied/proposed in EU countries and should make a decision on a pilot project to be developed in the Czech Republic.

### 8.5 Research, Development & Demonstration in CHP

At the moment, no state programme exists for the stimulation of research and development in CHP. The Czech Energy Agency, however, provides subsidies of up to 30% of investment costs for demonstration projects in the field of CHP and grants for finalisation of R&D projects. Given the extent of the research activities in other countries, RD&D priorities in Czech Republic should focus mostly on demonstration projects and technology transfer. The Czech Government should actively support and co-finance the Czech participation in energy RD&D programmes of the European Union, particularly the SAVE II and ALTENER programme of the EU, and the 5<sup>th</sup> Framework Programme.

#### *Actions - RD&D*

1. 2000: RD&D goals in CHP will be clearly defined by MIT and the National Energy Agency, making a regular monitoring and evaluation of RD&D efforts possible. The long-term strategy in this field will be developed, the budget will be set and the institutional framework will be created. The costs for this preparatory step are estimated at CZK 2 million.
2. 2001-2010: Apart from the support to R&D stated above, the majority of support will be on demonstration of CHP projects. The current annual budget of the Czech Energy Agency for demonstration in CHP will be increased to CZK 150 million in order to promote maturity of technologies.
3. 2000-2005: The Ministry of Industry and Trade and the Czech Energy Agency will arrange co-ordination of the RD&D activities in CHP, including possibilities of co-financing EU programmes from Czech sources. The annual budget will amount to CZK 100 million (all energy RD&D projects).
4. 2000-2005: The availability of progressive technologies for small and medium-scale CHP projects will be enlarged by promotion of demonstration projects and stimulating the co-operation of Czech industry with manufacturers in the EU and other countries.

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<sup>10</sup> CCAP (Helm N. et al.), 'Design of a Practical Approach to Greenhouse Gas Emissions Trading Combined with Policies and Measures in the EC', Centre for Clean Air Policy, November 1999, by courtesy of authors.

## 9. IMPACT OF THE CHP ACTION PLAN

### 9.1 Environmental impact

Improving energy efficiency by increasing the share of combined heat and power production will substantially contribute to the abatement of several environmental problems related to energy production and supply. Particularly environmental emissions to air caused by fossil fuel based energy supply, in particular CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub> and dust, will be reduced. In the Czech Republic where energy supply is mainly based on lignite. Therefore the impact of energy efficiency improvement on emissions reduction is high. Emission reduction studies have identified energy conservation as one of the main cost-effective options for the Czech Republic with a large potential. The reduction of these emissions will abate global, regional and local environmental burdens. An increase of the share of CHP in total electricity production from the current 19 % to 23 % in 2010 will from an environmental point of view the estimated reduction of CO<sub>2</sub> emissions of approx. 1.6 million tons a year<sup>11</sup>, corresponding to 1.2 % of total current CO<sub>2</sub> emissions.

### 9.2 Economic impact

A number of economic benefits can be identified. First, inefficiency in energy supply and demand leads to high expenditures for domestic energy production and imports. In the future, imports in the Czech Republic will increase. Increasing energy efficiency will decrease the expenditures for energy imports and decrease import dependency. Secondly, in industry, the penetration of energy efficient technology is often coupled with production increase. Therefore, energy efficiency and production efficiency go hand in hand. Increasing energy efficiency in energy-intensive industries will improve competitiveness. The increase of the share of CHP from 19 to 23 % in 2010 corresponds to an investment volume of about 18 billion CZK (only new capacity).

### 9.3 Social impacts

Energy efficiency improvement and the related energy savings have social benefits. First, the share of energy expenditures in household budget in the Czech Republic is relatively high compared to the EU. Improvement of energy efficiency of power and heat production could reduce their prices and thus energy expenditures of households. Secondly, the manufacturing and installation of new efficient technologies will require an extension of existing industry and services in the field of CHP technology and thus tend to creation of new jobs in manufacturing industry and building industry. The exact specification of social benefits related to the achievement of the targets is, however, beyond the scope of this study.

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<sup>11</sup> The exact quantification of the emission reduction resulting from CHP was not possible in the scope of the study. Therefore only an estimate of the reduction of CO<sub>2</sub> emissions, which is the most substantial benefit of achieving the targets, is presented.

# 10. SUMMARY OF THE CHP ACTION PLAN CZECH REPUBLIC

