Energy Efficiency in Environmental Permits

FINAL REPORT

IMPEL
NETWORK

European Union Network for the Implementation
and Enforcement of Environmental Law

S Y K E

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FOREWORD

The European Union Network for the Implementation and Enforcement of Environmental Law is an informal network of the environmental authorities of EU Member States and future Member States (before Candidate Countries). The European Commission is also a member of IMPEL and shares the chairmanship of management meetings. The network is commonly known as the IMPEL Network.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on certain of the technical and regulatory aspects of EU environmental legislation. The network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. It promotes the exchange of information and experience and the development of greater consistency of approach in the implementation, application and enforcement of environmental legislation, with special emphasis on Community environmental legislation. It provides a framework for policy makers, environmental inspectors and enforcement officers to exchange ideas, and encourages the development of enforcement structures and best practices.

Information on the IMPEL Network is also available through its web site at
http://europa.eu.int/comm/environment/impel

This report is the result of a project within the IMPEL Network. The content does not necessarily represent the view of national administrations or the Commission. The report was adopted on the 13th December 2002 during the 20th IMPEL Meeting in Copenhagen.

EXECUTIVE SUMMARY

The IMPEL project, on consideration of energy efficiency in environmental permits in implementing the IPPC directive, began in early 2001. The general principle of efficient use of energy is stated in Article 3 of the European Council directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC), which mostly concerns large industrial installations. This principle is new for environmental permitting, and the Member States have some problems with implementing it. The project consisted of a survey, studies of relevant documents and a seminar.

The main objectives of the project were:

- to investigate different opinions on how energy efficiency can be regulated in IPPC permits;
- to make a study on how energy efficiency is dealt with in the existing documents, the BREFs and voluntary environmental management schemes;
- to examine how voluntary environmental management schemes and energy saving agreements can be linked to the legal obligations in environmental permitting;
- to study the co-operation between environmental and energy administrations in the implementation of the IPPC directive; and
- to study the role of the authorities in the assessment of energy efficiency in applications and environmental permitting of large installations.

In this project the following good practices were found in relation to the main objectives:

- It is good practice to create practical guidelines to clarify and define energy efficiency. Overall guidance on energy efficiency is not possible, but the solution could be found in sector-wise guidance and, in general, energy should be looked at on a case by case basis. Good practical solutions such as benchmarking, pinch technology and energy balance checking were mentioned.
- In order to create good permit applications prior information exchange between the operator and the authorities is good practice. Also, application forms where the information requirements concerning energy efficiency are listed should be available on the Internet.
- No good practice for establishing binding permit conditions could be identified. However, the final report gives some concrete examples of more or less binding permit conditions. The permit condition or the text in the descriptive part could also be linked to voluntary energy saving agreements.
- It is good practice for environmental authorities to use the BREFs which contain a considerable amount of information on energy. The most specific information is available on energy consumption. There is less data on energy saving and energy recovery techniques.
- In inspections of energy efficiency good practice is self monitoring under the precondition that the inspector can influence the monitoring practices of the operator. Because of the lack of energy knowledge among the permit authorities and inspectors, there is a need for more co-operation between the energy and environmental authorities.
- The energy audit report should be available on site for environmental inspectors and the summary of audit findings should be submitted as a part of any annual environmental report.
- Co-operation between energy and environmental authorities on energy efficiency issues is good practice and should be developed. Each authority has special knowledge that the others may need or could use in their work.
- It is good practice to have transparency in environmental permitting concerning energy efficiency, so that the Aarhus Convention really is implemented in the same way in different countries. Transparency in all voluntary measures is also good practice.

- The environmental management systems provide a good tool for managing energy issues. The policy and targets set by the company should not be transferred as such to the permit. This could negatively affect the companies' interest in setting targets and even in using environmental management systems. There should also be clear and attractive incentives for the companies to join the management systems.
- It is in itself good practice when voluntary energy saving agreements are made for most of the industries in a country, which should lead to energy savings and the efficient use of energy. Concrete measures are already included in the agreements and should be followed up.
- As the environmental authorities in general do not have enough knowledge of energy efficiency it is good practice to provide general training for environmental authorities and to raise the level of knowledge. It is also good practice to create fact sheets which contain information on energy efficiency as a tool for environmental permitting, supplementing the BREFs and any national BAT guidance. Good practice is that the environmental authorities are provided with information from the voluntary energy audits made by energy experts.

Proposals for further work:

- There are few concrete examples of permit conditions concerning energy efficiency from the participating countries. This issue should be followed up after some years when a significant share of all large industries have had their new permits granted.
- General guidelines of what can be considered as confidential in the permit procedure especially on energy issues should be developed.
- Sector specific BREFs with more information on energy efficiency issues, a horizontal energy efficiency BREF and a cross-media BREF where the emissions are linked also to the need of energy should be developed.
- The link between the permit and voluntary measures should be clarified.
- The understanding of the link between the permit and the future greenhouse gas emissions trading scheme should be improved.
- There is also a need for guidelines on the inspection procedure to be used in the auditing of energy efficiency.

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1 INTRODUCTION

Energy is central to social and economic wellbeing, but its production and consumption put considerable pressures on the environment in emissions to the atmosphere and biosphere. These may lead to dangerous changes in the global climate, damaging natural ecosystems, tarnishing the built environment and harming human health.

In the industrial sector, these emissions may arise from the combustion of fuels to generate heat or power or through the direct use of energy within a production process. In both cases there are potentials for energy saving, increased production of heat and power and reductions in environmental emissions. The European Union's (EU) target under the Kyoto Climate Change Protocol for cutting greenhouse emissions is 8 % below the 1990 levels by the 2008–2012 period. EU's emissions of greenhouse gases fell by 3.5 % between 1990 and 2000, but without additional counter-measures they are likely to rise back to around the 1990 level by the year 2010.

The IMPEL project on consideration of energy efficiency in environmental permits in implementing the IPPC directive began in early 2001. The general principle of efficient use of energy is stated in Article 3 of the European Council directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC) which mostly concerns large industrial installations. This principle is new for environmental permitting and the Member States have some problems with implementing it. Article 6 of the directive has stipulations on the requirements of an application which the applicant must be aware of and Article 9 deals with the duties of the permit authorities concerning BAT and energy efficiency.

The main objectives of the project in the terms of reference were:

- to investigate different opinions on how energy efficiency can be regulated in IPPC permits
- to make a study on how energy efficiency is dealt with in the existing documents, the BREFs and voluntary environmental management schemes
- to examine how voluntary environmental management schemes and energy saving agreements can be linked to the legal obligations in environmental permitting
- to study the co-operation between environmental and energy administrations in the implementation of the IPPC directive and
- to study the role of the authorities in the assessment of energy efficiency in applications and environmental permitting of large installations.

This project investigated how energy efficiency was regulated in IPPC permits, how the BREF documents have been used or can be used in permitting and how the voluntary energy saving agreements and voluntary environmental management schemes have been used or can be used in consideration of energy efficiency. The overall objective was to find out what is good practice in determination of energy efficiency for industrial operations and how to state it as a permit condition if, for example using the BREFs, voluntary environmental management systems or energy saving systems.

A three-step process was used to get the necessary information. First a draft questionnaire was drawn up and discussed in a meeting of members in the advisory committee. In the advisory committee were members from Austria, Finland, Germany, the Netherlands, and Sweden and the IMPEL co-ordinator. The finalised questionnaire was then sent out to the Member States and future Member States. The replies to the questionnaire were analysed. The second step was to hold a seminar to get more in-depth information, where the most problematic questions were discussed, key difficulties identified and good practices for different situations were agreed on. The seminar

was held in Helsinki on 6–8 February 2002. The third step was to examine eight BREF documents and make studies on technical possibilities to use energy efficiently and on options for emissions trading in the European Union.

The questionnaire covered specific topics from the IPPC directive and its implementation in the countries. In particular the contents of Articles 3(d), 6(1), 9(1), 9(8) and 15(1) were looked at. The questionnaire also covered other topics such as competent authorities, voluntary environmental management systems, energy saving agreements, energy taxes and emissions trading. The aim of the questionnaire was to clarify the similarities and differences between the countries in implementation of the IPPC directive and in the practices of the authorities permitting IPPC installations. The following countries replied to this questionnaire: Austria, Denmark, Finland, France, Germany, Ireland, Italy, Lithuania, the Netherlands, Poland, Portugal, Sweden and the United Kingdom. The compilation of the answers to the questionnaire is presented in Annex I of this report.

The seminar themes were the legal base for energy efficiency, consideration of energy efficiency in environmental permitting, energy issues in environmental management schemes and energy saving agreements and emissions trading. In the seminar, key difficulties in the handling of energy issues in environmental permitting were discussed and possible solutions to the problems were suggested and finally good practices for the consideration of energy efficiency in environmental permitting of large installations were agreed on. The chairmen of the seminar were Mr Antero Honkasalo, Environment Counsellor, Ministry of the Environment and Mr Alec Estlander, Division Manager, Finnish Environment Institute. The seminar agenda and the list of participants are presented in Annex II of this report. The seminar report was sent out to the participants for comments in February 2002 and their comments have been incorporated into the seminar report and in the final report.

The project was led by the Finnish Environment Institute. The project team consisted of the project leader, Ms Marianne Lindström, Project Manager, Finnish Environment Institute, and six experts. The experts were: Ms Elise Sahivirta, Legal Scientist, Ms Jaana Pennanen, Mr Mikko Attila, Ms Terhi Ihalainen, Environmental Scientists; and Mr Davide Secci and Mr Thomas Kohl, students of engineering. All the experts were employees of the Finnish Environment Institute.

The Finnish advisory team consisted of Ms Sirpa Salo-Asikainen, Environment Counsellor, Ministry of the Environment; Mr Pentti Puhakka, Senior Adviser, Ministry of Trade and Industry; Mr Jouni Punnonen, Energy Counsellor, Finnish Association for Industry and Employees; Ms Emelie Enckell, Chief of the Environmental Protection Division, Uusimaa Regional Environment Centre and Mr Kai Nykänen, Senior Adviser, the Pohjanmaa Regional Environment Centre.

The Advisory Committee for the project comprised Mr Otto-Werner Schaubschläger, Austria; Ms Sirpa Salo-Asikainen, Finland; Ms Emelie Enckell, Finland; Mr Tapio Kovanen, Finland; Mr Pentti Puhakka, Finland; Mr Jouni Punnonen, Finland; Mr Ulrich Buntrock, Germany; Mr Frans Bruinsma, The Netherlands; Mr Erik Nyström, Sweden and Mr Terence Shears, the United Kingdom.

Ms Marianne Lindström, Ms Elise Sahivirta, Mr Mikko Attila and Ms Jaana Pennanen drafted this report. Ms Terhi Ihalainen made a study on emissions trading in the European Union (Annex V), Mr Davide Secci, from Switzerland, made a study on the BREFs (Chapter 5) and Mr Thomas Kohl, from Germany, did a study on technical possibilities for energy efficiency (Annex IV). The first draft report was sent out for comments in October 2002 to the participants in this project.

We are grateful to all those who participated in this project by taking part in the advisory committee work, by answering the questionnaire, by taking part in the seminar and by providing us with examples of permit conditions, existing guidelines and comments on the draft report.

2 LEGAL BACKGROUND

2.1 General background

The European Union has been active in the field of combating climate change in various ways that cannot all be listed here. But just to name a few steps towards protecting the climate and prevent climate change we can point out, for example Council Decision 91/565/EEC, where the Council adopted the SAVE programme (Specific Actions for Vigorous Energy Programme) that aimed at promoting energy efficiency in the Community. Council directive 93/76/EEC aimed to limit carbon dioxide (CO_2) emissions by improving energy efficiency (the SAVE directive). The demand for efficient use of energy is a general principle within Council directive 96/61/EC on Integrated Prevention and Control (henceforth the IPPC directive). The European Union is also a party to international treaties in the field of climate protection. The United Nations Framework Convention on Climate Change dates from the year 1992 and the Kyoto protocol was signed in 1997. The European Union ratified the Kyoto protocol in summer 2002.

The European Union's Sixth Environment Action Programme also stated that: "In addition, special attention will be paid to four priority areas for action… Tackling climate change: Objective – to stabilise the atmospheric concentrations of greenhouse gases at a level that will not cause unnatural variations of the earth's climate. The scientific consensus is that climate change is happening and that human activity is causing the increases in concentrations of greenhouse gases that are the cause of the problem. The key priority for the Sixth Programme will be the ratification and implementation of the Kyoto Protocol (see above) to cut greenhouse gas emissions by 8 % over 1990 levels by 2008–12. This must be considered as a first step to the long-term target of a 70 % cut." (COM/2001/0031 final, 3).

The legal and administrative "command and control" regulation approach has been the traditional way to guide environmental protection in the European Union. The same approach is adopted also in the IPPC directive (Backes and Betlem 1999, 120). As a method "command and control" by legislation is still in a dominating position as an environmental policy tool, but in addition environmental issues are included in various other policies, and to stop climate change the methods go beyond legislation by using trading schemes and voluntary measures. Market based voluntary methods emphasise less control by authorities and the operators' obligation to "play by the rules". In these cases the minimum requirements are fixed through the permitting system that is supplemented by voluntary methods. Some of the Member States have chosen market-based measures, such as energy saving agreements, EMAS and ISO 14001, in addition to "command and control" regulation to implement the directives articles concerning energy efficiency. The problem within energy efficiency regulation is that various methods have little, if any, connection with each other. The control system of energy efficiency is basically sector-oriented.

FIGURE 1. The present ways to control energy efficiency.

2.2 Implementation of the IPPC directive

The IPPC directive was adopted by the European Council on 24 September 1996, was published on 10 October 1996, and entered into force on 30 October 1996. The Member States had until 30 October 1999 to take appropriate implementing measures. The requirements to apply its authorisation requirements to new plants must be given effect no later than three years after the directive entered into force, the deadline was 30 October 1999. Many of the Member States failed to meet that deadline. Some of the directive's provisions have to be applied to existing plants as of that date, whereas the rest will have to be applied within eight years thereafter (Article 5), the deadline is 30 October 2007. Of the future Member States, Poland and Lithuania took part in the project and they had not implemented the IPPC by the time of the questionnaire, summer 2001. In Poland the IPPC was already transposed into national law, but the laws came in force after the questionnaire was answered. With the future Member States the implementation schedule of the IPPC directive is the same as for the present Member States, except for certain existing installations that have been granted an additional transition period. Altogether the implementation into the national legal systems did not, according to the answers to the questionnaire, cause any problems but the implementation in practice has proved to be more difficult than anticipated (Annex I, Table 1).

The implementation of the IPPC directive required at least some legislative measures in all of the Member States; some adopted totally new laws and in some Member States only minor changes of legislation were needed. The implementation level differed in the Member States because of the legislative starting points: for example in Sweden and France the integrated approach was already adopted in legislation, whereas in Germany the federal state legislative system and constitutional issues have made the implementation process difficult. The implementation has been done technically by amendments to different sector laws as in Austria or by a larger codifications as in Finland. The actual implementation situation in the Member States varies also because of the transition period lasting until 2007. For example, in Finland the installations under the Environmental Protection Act that implemented the IPPC directive are due for permitting at different times. The first wave is due at the end of 2003 and the second by the end of 2004, so all of the now approximately 630 Finnish IPPC installations will comply with the IPPC by the end of 2007. In the questionnaire some countries have described the situation at the time they completed the questionnaire, some after full implementation, and in that respect the questionnaire does not show a real picture of the implementation situation in summer 2001 when all the answers were given (Annex I, Tables 1 and 2).

The IPPC directive creates a requirement for industrial facilities, which fall under its scope of coverage to be made subject to authorisation through permitting. The Articles covering energy efficiency that are under this projects agenda are:

> **Article 3:"** General principles governing the basic obligations of the operator Member States shall take the necessary measures to provide that the competent authorities ensure that installations are operated in such a way that:…(d) energy is used efficiently; …"For the purposes of compliance with this Article, it shall be sufficient if Member States ensure that the competent authorities take account of the general principles set out in this Article when they determine the conditions of the permit.
> **Article 6**:" Applications for permits 1. Member States shall take the necessary measures to ensure that an application to the competent authority for a permit includes a description of - the installation and its activities, - the raw and auxiliary materials, other substances and the energy used in or generated by the installation, - the sources of emissions from the installation, - the conditions of the site of the installation, - the nature and quantities of foreseeable emissions from the installation into each medium as well as identification of significant effects of the emissions on the environment, - the proposed technology and other techniques for preventing or, where this not possible, reducing emissions from the installation, - where necessary, measures for the prevention and recovery of waste generated by the installation, - further measures planned to comply with the general principles of the basic obligations of the operator as provided for in Article 3, - measures planned to monitor emissions into the environment. An application for a permit shall also include a non-technical summary of the details referred to in the above indents.
> **Article 9**:" Conditions of the permit 1. Member States shall ensure that the permit includes all measures necessary for compliance with the requirements of Articles 3 and 10 for the granting of permits in order to achieve a high level of protection for the environment as a whole by means of protection of the air, water and land.
> (8.) Without prejudice to the obligation to implement a permit procedure pursuant to this Directive, Member States may prescribe certain requirements for certain categories of installations in general binding rules instead of including them in individual permit conditions, provided that an integrated approach and an equivalent high level of environmental protection as a whole are ensured.
> **Article 15**:" Access to information and public participation in the permit procedure 1. Without prejudice to Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment (14), Member States shall take the necessary measures to ensure that applications for permits for new installations or for substantial changes are made available for an appropriate period of time to the public, to enable it to comment on them before the competent authority reaches its decision. That decision, including at least a copy of the permit, and any subsequent updates, must be made available to the public. 2. The results of monitoring of releases as required under the permit conditions referred to in Article 9 and held by the competent authority must be made available to the public. 3. An inventory of the principal emissions and sources responsible shall be published every three years by the Commission on the basis of the data supplied by the Member States. The Commission shall establish the format and particulars needed for the transmission of information in accordance with the procedure laid down in Article 19. In accordance with the same procedure, the Commission may propose measures to ensure intercomparability and complementarity between data concerning the inventory of emissions referred to in the first subparagraph and data from other registers and sources of data on emissions. 4. Paragraphs 1, 2 and 3 shall apply subject to the restrictions laid down in Article 3 (2) and (3) of Directive 90/313/EEC.

Transposing the energy efficiency requirements and the articles of the directive (Articles 3 (d), 6(1), 9(1, 8) and 15 concerning access to information and public participation in the permit procedure) into legislation were not seen as problematic. Some Member States, for example, Austria and Portugal had adopted the exact wording of the directive and some had more detailed national prescriptions. On the other hand, the practical implementation of this kind of a basic obligation such as Article 3(d), was seen as very problematic. The main reasons for problems that were stated were in connection with the lack of an explicit definition of energy efficiency, with a lack of experience in the field of practical implementation of energy efficiency and with the lack of guidance, for example, in BREFs. In general, the wordings of the IPPC directive concerning energy efficiency were considered to be very open.

In Finland the national legislation has in practice been specified by using commonly acceptable non-binding guidance, created by several stakeholders. Altogether the common opinion of the

countries within the project was that the whole concept of energy efficiency was vague and as such difficult to implement in practice. With the concept of energy efficiency in permitting, it has to be asked whether the problem lies in flexible norms themselves or in the lack of national guidance or in the lack of experience or perhaps in all three. In any event regulation with exact wordings is not always possible and in some cases not even reasonable. The most effective way to reach equity in interpretations would be in common negotiations through which reasonable interpretations could be reached (Annex I, Tables 2, 3 and 7).

In most countries energy efficiency also applies to installations not falling under the IPPC directive. These installations, to which the energy efficiency requirement applies, are estimated to cover about 65–85 % of the total industrial energy use. These figures are rough estimations and not all countries could give any percentage figure. But those that could answer the question (total 8 countries) estimated the figure to be large, if not accurate. The incentive to require energy efficiency might yet come also from different demands than those caused by the implementation of the IPPC directive, for example from the taxation of energy or from grants for energy saving projects. The United Kingdom and Ireland said in their replies that the requirement for energy efficiency only applies to IPPC installations. In Finland the obligation to use energy efficiently is applied to at least IPPC plants, but there are no legal obstacles to prevent it being applied also to other installations. Altogether in most of the Member States the requirement for energy efficiency applies widely to all sectors of industry that use energy. (Annex I, Tables 10–13).

The IPPC directive is to be applied to all installations covered by the directive by 31 October 2007. In many countries there is a transition period for existing installations to comply with the demands of the renewed legislation. This applies also to the demands of BAT of which energy efficiency is also a part (see Section 4.5 and Chapter 5 of this report).

> Article 2 of the IPPC directive defines BAT: "Best available techniques shall mean the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole" And by defining BAT in accordance to the Annex IV of the directive, the following must be taken into consideration "The consumption and nature of raw materials (including water) used in the process and their energy efficiency."

Costs efficiency plays a role in permitting existing and new installations – as is pointed out in the Portuguese answer “for existing installations, cost and advantages for new legal requirements regarding energy efficiency demands will have to be balanced in order to avoid shutdowns”. In many cases the transition periods are not organised according to the requirements for energy efficiency, but instead as a general transition period to implement an integrated permitting procedure for all the installations falling under the scope of either the Annex I of the IPPC directive or under wider national arrangements. (Annex I, Tables 11 and 12)

2.3 Definition of efficient energy use

From the answers to the questionnaire, the wordings of the IPPC directive concerning energy efficiency issues were considered to be very open and there was a recognised need for definitions in order to clarify the practical implementation of the requirements for energy efficiency. The seminar, organised in Helsinki, also discussed whether there would be a need for guidance in defining energy efficiency and what kind of guidance would be needed. It was also pointed out, that the definition on search was a practical definition, not a legal one.

Article 9(8) gives the Member States an opportunity to use general binding rules (GBR) in implementation of the IPPC directive. The GBRs are not generally used in clarifying energy efficiency, but there are some branch general binding rules, for example in France, that include at least some consideration of energy efficiency, like clarification of energy consumption and justification of energy choice. Only France has actually used GBRs with some consideration on energy efficiency. However, France pointed out that general binding rules should here be understood as binding guidance (Annex I, Table 15). Also, other countries are considering the possibility of using GBRs in the future. The general binding rules are, or would all be considered as, minimum requirements: there would still be a possibility to impose case by case stricter requirements. (Annex I, Table 16. For more about the GBRs, see Section 4.1 and The Application of… 2000).

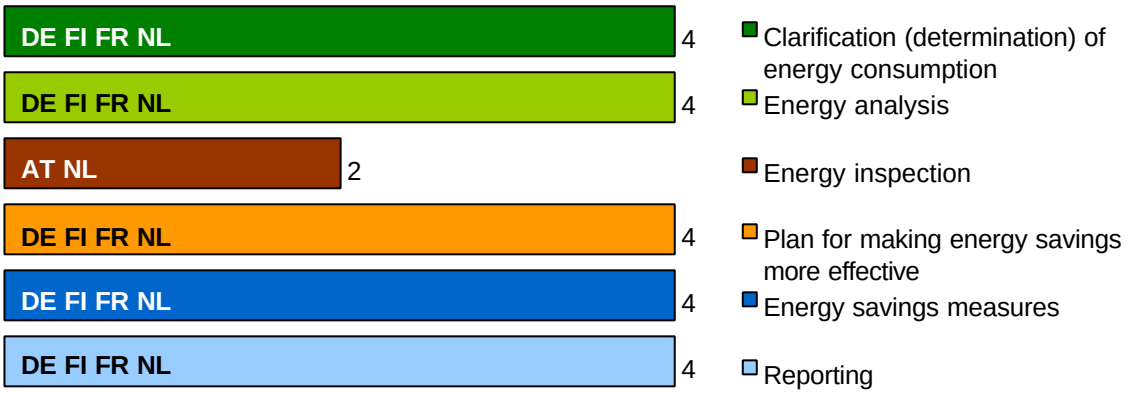

FIGURE 2 (Annex I, Table 15). If there would be General Binding Rules for energy efficiency, the main contents of the rules would, according to the replies, consist of the above mentioned parts.

There are some definitions of energy efficiency in use in the Member States' legislation. The definitions are mostly at a general level but for instance in Germany there is a branch wide definition but only for waste incineration (Annex I, Table 8). Instead, most of the countries provided both general and branch-wide guidance on defining energy efficiency in the form of reports, technical information sheets or guidebooks produced by several stakeholders (Annex I, Table 9).

In the discussions at the Helsinki seminar it was pointed out that there are several approaches available to define energy efficiency about which there was no general consensus. It was also pointed out that reducing energy use is not always the most efficient approach from the environmental point of view, given that reducing energy might mean even more emissions. In defining what is "useful" energy and what is not it could be said that, for example, it is useful energy to reduce emissions up to a certain point. There was also a discussion about energy losses which are quite easy to check. Yet the participants agreed that overall guidance on energy efficiency is not possible, the solution could be based on sector-wise guidance and, in general, efficiency should be looked at on a case by case basis. There was no approach that was found to be superior to the others. The participants of the seminar agreed that several approaches are good and can be used in parallel. Of the approaches benchmarking and balance checking were discussed and seen as useful tools (see Chapter 6). There is a need to determine energy balance, inputs and outputs, but it is very difficult to verify this information. It was also agreed at the seminar that there is a need for horizontal BREFs (that is the one on generic energy efficiency techniques and the one on economic and cross-media issues.)

3 THE AUTHORITIES AND ORGANISATIONS

3.1 The competent authorities and organisations

This section deals with the national competent authorities and other organisations that are responsible for energy and environmental issues and that grant, change and supervise environmental permits. Most of the participating Member States and also the future Member States (Lithuania and Poland) have different authorities responsible for national energy policy and environmental issues. The most common situation is that the ministry or department of economics or finance or trade or industry or enterprise is responsible for energy policy on the national level and the ministry or department of environment or agriculture or forestry or housing is responsible for environmental issues.

Competent authorities and organisations concerning energy issues

The common situation is as described above. The responsibility can also be shared between ministries and authorities as in Sweden, where it is shared between the Ministry of the Environment, the Ministry of Industry and the Swedish National Energy Administration. In France, the Ministry of Economy, Finance and Industry is responsible for the definition of national policy of energy and the Ministry of Spatial Planning and the Environment is responsible for the definition of national policy on the rational use of energy. The only exceptions are Ireland and Sweden, where two ministries or departments are co-operating in the field of energy policy and the rest of the ministries are also responsible for environmental issues. (Annex I, Tables 17–18)

Competent authorities and organisations concerning environmental issues and guidance on energy efficiency

In nearly all of the participating countries the ministry or department of the environment has the main responsibility for environmental issues. The Netherlands has joint responsibility between two ministries – the Ministry of Economic Affairs and the Ministry of Housing, Spatial Planning and the Environment. In Sweden the Environmental Protection Agency is the competent authority, but also all other authorities must take environmental aspects into consideration as appropriate. The actual situation on the consideration of environmental aspects also by other authorities is presumably similar in many other participating countries, but there is no clear evidence of this in the replies to the questionnaire. (Annex I, Table 18)

In most of the countries competence for giving guidance on energy efficiency in permits is given to the same ministry which is responsible for environmental issues or to the national environmental protection agency (EPA). In Germany, in matters where the ministry does not give the guidance, the "Länder" can themselves give guidance. The Portuguese competent authorities are the Environmental and Land Planning Ministry in co-ordination with the General Directorate of Energy. In Sweden the permit authorities, that is the environmental courts, and the county administrative boards, are not bound by the guidance given by the EPA. (Annex I, Table 19)

Competent authorities for issuing permits including energy efficiency

The IPPC directive does not stipulate how many permit granting authorities a Member State has to have, but it stipulates that the permit has to be fully co-ordinated in cases of several competent authorities. In Article 2 of the directive the concept of a "competent authority" is defined:

> "Competent authority shall mean the authority or authorities or bodies responsible under the legal provisions of the Member States for carrying out the obligations arising from this Directive".

The Member States thus have the opportunity to organise the question of competent authorities according to national interests as long as the co-ordination between different authorities is fully organised.

Most of the participating countries (for example Austria, Denmark, Finland, Italy, the Netherlands and Sweden) have a system where several authorities are issuing environmental permits depending on the geographical location, size or environmental impacts of the installation. Major installations are permitted by a ministry, environmental protection agency or an environmental court and the smaller ones by a regional or local authority. (Annex I, Table 20)

Another system to organise permitting (e.g. Portugal) is that only one authority grants permits. A variation of this is the German system, which is based on regional level authorities, depending on the organisation of the system in the various "Länder". (Annex I, Table 20)

Competent authorities for monitoring compliance and enforcement with energy use and energy efficiency conditions

Many of the participating Member States (e.g. Denmark, Germany, Ireland, Italy, the Netherlands, Portugal and the United Kingdom) and also Lithuania have the same competent authorities for monitoring and enforcement of energy use and energy efficiency conditions as for permitting. In addition to these, the Finnish Ministry of Trade and Industry is also involved in this issue concerning the voluntary agreements. (Annex I, Tables 21–22)

If a voluntary energy saving agreement is made between an authority and a company, the competent authority for monitoring on the national level is, in Denmark the Danish Energy Agency, and, in Finland, the Energy Information Centre for Energy Efficiency and Renewable Energy Sources (Motiva). However, these two authorities are responsible only for the voluntary agreements. For other cases in Denmark, the authorities are the same as for permitting. In Finland the regional environment centres are always responsible for monitoring the permit conditions. However, the monitoring in Finland and Sweden is mainly in the form of self-monitoring by the companies. In Sweden the county administrative boards carry out the monitoring of compliance of all types of conditions in permits for almost all IPPC installations. (Annex I, Table 21)

In France the national level authorities are the Ministry of the Environment and the Ministry of Industry and, on the regional level, "Direction Régionale de l'Industrie de la Recherche et de l'Environnement", which operates under the responsibility of the same representative that issues the permits. The competent authorities who enforce energy use and efficiency are the same as for monitoring. (Annex I, Tables 21–22)

3.2 Co-operation between authorities and organisations

Article 7 of the IPPC directive states, that

> Integrated approach to issuing permits:
>
> "Member States shall take the measures necessary to ensure that the conditions of, and procedure for the grant of, the permit are fully co-ordinated where more than one competent authority is involved, in order to guarantee an effective integrated approach by all authorities competent for this procedure."

While the assumption was that there might be some problems in co-operation, this was not generally seen as problematic. There is a great deal of co-operation between the authorities, and even the countries where there is no co-operation, do not see any problems arising from the division of authorisation. Each authority has special knowledge that the others may need or could use in their work. Especially in this case the development of co-operation would be highly recommended since energy efficiency is not a very clear and simple concept.

All of the Member States have several organisations involved in issues concerning energy efficiency. There are mainly ministries (environment, industry or economics), environmental protection agencies, energy centres and branch organisations, which cover the field of energy efficiency. Different energy efficiency agencies and non-governmental organisations also participate in many countries. (Annex I, Table 23)

According to the replies to the questionnaire, seven countries (Austria, Finland, France, Ireland, Italy, Sweden and the United Kingdom) have co-operation between different authorities and organisations concerning implementation and guidance in the permit procedure. The co-operation is mainly in the form of consultations, working groups and seminars between the different actors. In the Netherlands there is in general no co-operation on individual permit procedures and in Portugal there might be co-operation in this field in the future. (Annex I, Table 24)

Half of the participating countries replied that there is co-operation between environmental authorities, energy authorities and other organisations in the monitoring and enforcement of energy use and efficiency in the permit procedure. In Italy it is only information exchanges and in the Netherlands the authorities are informed by the national agency for energy and the environment (Novem) if companies do not perform adequately. Authorities will then start a procedure to enforce or adapt the permit. (Annex I, Tables 25–26)

Where non-regulatory energy efficiency schemes are used in the United Kingdom, as part of the permit requirements for the IPPC, these are monitored by the government. Where the conditions of non-regulatory energy efficiency schemes are not met by a permit-holder to the satisfaction of the government, the regulating authorities are notified and enforcement action may result. Finnish authorities and the Confederation of Finnish Industry and Employers had a common steering group when drafting a guidebook for energy efficiency in environmental permits and they also participated in drafting the permit application form for assessing energy efficiency (Annex III). In France the local representatives of the energy authority and the environment authority are under the same regional direction of research, industry and environment (DRIRE). (Annex I, Tables 25–26)

4 ENERGY EFFICIENCY IN THE PERMIT PROCEDURE

4.1 Guidance for the applicant

In the replies to the questionnaire concerning energy efficiency in environmental permitting it was apparent that one of the main problems is lack of specific guidance at different levels of the permitting procedure.

The Article 9(8) of the IPPC directive allows Member States to use General Binding Rules (GBRs) in place of certain aspects of installation specific permits, as long as the integrated approach is maintained and an equivalent high level of environmental protection is ensured. The need for ensuring an equivalent high level of environmental protection means that GBRs cannot be used where the local environment is particularly sensitive. In such a case only individual BAT determinations can be used. Thus, GBRs are appropriate where emissions do not lead to local problems or where interactions with individual media are predictable. The following criteria should apply before consideration is given to the development of a GBR:

- A GBR must cover a sufficient number of installations of that category to make development of the GBR cost-effective.
- The current status of technology and techniques in the category must not be fast moving, as GBRs cannot be updated frequently.
- Installations must have a relatively uniform impact on the environment.
- The sector should be covered by a well organised trade association to ensure agreement on the details of the GBR.
- GBRs must be amenable to inclusion in a statutory document.

GBRs will need to be reviewed whenever significant changes take place either in the techniques used by the category of installation or in the understanding of the environmental impacts of its operation. GBRs might pose some problems for stakeholder participation, particularly during public consultations on permit applications, as the condition to be applied cannot be varied (IMPEL report: General Binding Rules, 2001).

Some Member States such as Denmark, Finland, France and the United Kingdom have guidance concerning energy efficiency but usually no quantified objectives have been set. In Denmark some sector energy analysis and some horizontal guidelines (e.g. on ventilation, heating, compressors and electric light) exist. The Danish Energy Agency provided the guidelines (Annex I, Tables 27 and 28).

In Finland the Ministry of Trade and Industry together with the Finnish Environmental Institute ordered from Energia-Ekono Ltd a study on energy efficiency in environmental permits and energy saving agreements. This study was the first in Finland that was aiming at implementation of the IPPC directive's requirement on energy efficiency (Energy Efficiency… 1999). In the study a method was developed based on the calculation of an energy efficiency index. This method was tested in different installations and seemed to work best in the pulp and paper industry.

Thereafter, the Finnish Ministry of the Environment ordered from Electrowatt-Ekono Ltd a study on consideration of energy efficiency specifically in the environmental permit procedure (Siitonen et al. 2001). The steering group for this study included members from the Ministry of the Environment, the Ministry of Trade and Industry and the Confederation of Finnish Industry and Employers. The report concludes that an energy assessment always must contain numerical information as well as a verbal description. Information should be presented in such a format that total energy con-

sumption and also energy distribution between different units are shown. The effects of environmental investments on energy use should also be specified. Changes in energy efficiency can also be described with a plant or sector specific index value if such an index has been defined. This report also contained a proposal for an application form for assessment of energy efficiency as attachment to the environmental permit application form. Yearly reports and reports made under energy saving agreements are used when reporting to the environmental authorities on permit compliance. The Finnish application form has no official status but it is generally used in practice (Annex III).

In France there are some considerations on energy efficiency in the guidance for the applications. The French environmental law states that the Ministry of the Environment can impose general rules. The documents from the ADEME (Agency for the Environment and Energy) provide sector-wise information about energy efficiency and energy efficient technology. The sectors are: Glass Industry, Combustion Plants, Cement Industry, Paper Industry and Incineration Plants. In France there are also several ministry decisions on different industrial sectors in which energy management is incorporated:

1) Ministry Decision on the Glass Industry: The plant manager must take all necessary measures in the design and the management of the plant to limit energy consumption. He must make available to the environment inspector the reasons for the choice of energy sources as well as information about the energy efficiency of the installation.
2) Ministry Decision on the Paper Industry: The plant manager must take all necessary measures in design and management of the plant to reduce air pollution at the source, in particular by optimising energy efficiency.
3) Ministry Decision in relation to Use and Consumption of Water, to Air Emissions of any kind from Classified Installations: The plant manager takes all necessary measures in design and management of the plant to reduce air pollution at the source, in particular by optimising energy consumption.
4) Ministry Decision on Incineration Plants of Industrial Waste: The plant must be designed and managed so that calorific energy produced by waste combustion can be recycled and of value. The percentage of energy of value is defined as the ratio of valuable energy and energy produced at the output of the boiler. Caloric or electric energy produced by the plant is said to be of value when it is actually consumed or sold to a third person.

France also has draft ministry decisions on boilers with capacity grater than 20 MWh and on co-incineration and incineration plants of non-dangerous substances. The French guidance is binding but it does not provide quantified objectives. Additionally, information on voluntary energy saving agreements and emission reduction are made available to the local representatives of the environmental authorities.

The application form in Portugal has to be used when the operator applies for a permit. Furthermore, in Portugal the General Directorate of Energy and the Centre for Energy Conservation have developed several sector initiatives providing guidance on energy auditing (textiles, ceramics, dairies, and wood and cork). Portugal also has definitions on minimum efficiency requirements for hot water boilers and definitions on energy consumption optimums for the following industrial sectors: food and drinks, textiles, wood and cork, pulp and paper, chemistry and cement, ceramics and glass.

In the Netherlands, in general, energy measures are implemented based on the environmental law. Implementation depends on the category of the installation and whether a company has joined a voluntary reduction agreement.

a) For the highest energy consumers, >0,5 PJ/a, benchmarking is used. The companies are compared with the world's best performing installations. If their performance is less than the best, they have to draw up an improvement plan and the measures will be implemented in the permit. About 200 companies have joined this scheme and have started the comparison.
b) For other major energy consumers, mainly industrial, that covers together about 90 % of total energy consumption of industry, there is the voluntary agreement, MJA.
c) Non MJA-companies are requested to apply for a permit review and the permit authority will decide on the measures. Guidelines for this process and possible measures are made available by means of technical information sheets by Novem (National Agency for Energy and the Environment). The selection depends largely on the payback period of the required investment, which usually is 4 years.
d) AMVB installations have general binding rules. They are mainly smaller installations such as offices, restaurants, shops and glasshouses and they are exempted from the permit requirement.

The Netherlands has the following regulations in use for those companies which have not joined a voluntary saving agreement (referring to point c above). Those are divided further into two categories in terms of annual energy use. The following regulations, considered as GBRs, are valid for bigger companies (Circular… 1999, 25–28, unofficial translation):

Regulation 1: Performance of energy saving study
Performance term of energy saving study…[indicate]. (Part of the) installation at which the study is aimed…[describe].

The results of this study are laid down in a report, containing at least the following information:

1. Description of the object;
2. Description of the survey of the energy balance of the object as a whole, and an assignment of at least 90 % of the total energy consumption to individual installations and (parts of) processes;
3. A survey of the possible energy saving techniques and/or measures, aimed at the installations and (parts of) processes, that, according to the energy balance, make the largest contribution to the total consumption;
4. For each energy saving measure the following information:
   - annual energy saving
   - (additional) investment costs
   - expected economical lifespan
   - annual saving of energy costs, based on energy tariffs as they apply to the company at the time of the study
   - estimation of possible additional costs or benefits other than energy saving
   - payback time, based on (additional) investment costs and benefits;
5. A survey of possible organising and good housekeeping measures, which lead to energy saving.

Regulation 2: Drawing up a company energy plan
On the basis of the report a company energy plan is being drawn up, according to the format prescribed in the circular "Energy in the environmental permit". Measures with a payback time of up to and including five years will be included in the plan. Phasing over a certain period of time is allowed here. If one of these measures will not be carried out, this will be motivated.

Regulation 3: Producing study report and company energy plan for approval
Timetable of delivering the study report and company energy plan to the competent authority for approval…[indicate].

Regulation 4: Carrying out company energy plan
The company holder carries out the company energy plan within the terms set in the plan.

Additionally there are measuring and registration, instruction and maintenance regulations and a reporting obligation.

In Italy no guidance for applicants is available at the moment. The environment agency is studying a possible approach to energy efficiency evaluation in the industry through the use of pinch technology.

Germany has no general binding rules because of the political goal to meet the CO_2-reduction regarding the Kyoto protocol by voluntary agreements. Germany has used GBRs for steel mills and waste incineration plants already before the IPPC directive came into force. In Germany there are guidelines for energy management in companies, including pinch technology for improvement of energy efficiency and practical guidelines for the improvement of rational energy use in the industry. Also, VDI's (Association of German Engineers) guidelines can be used as a source of information from a non-governmental organisation.

Sweden is considering the use of general binding rules.

In the United Kingdom there is a draft Horizontal Guidance Note on Integrated Pollution Prevention and Control and Energy Efficiency (Horizontal Guidance Note IPPC H2). There are also sector guidance notes for each industrial sector with information for the applicants. Where the European Union has issued a BREF document for a sector, the information it contains is taken into account in the Sector Guidance Note. The purpose of this draft horizontal guidance note is to provide supplementary information to assist applicants in responding to the energy efficiency requirements described in the IPPC Sector Guidance Notes. All installations under the scope of the IPPC Directive shall provide the authorities with the following information:

- energy consumed or generated and the direct or indirect carbon dioxide emissions;
- energy management provisions;
- proposed measures for the improvement of energy efficiency in operating and maintenance procedures, control of excessive heating and cooling losses and building services;
- provision of an energy efficiency plan that identifies energy efficiency techniques that are applicable to the operation of the activities.

The applicants use this guidance but may ultimately negotiate actual conditions with the competent authority. The environmental impact of carbon dioxide emissions is global and indirect in effect and there is no universally acceptable methodology that assesses this impact in terms of emissions concentrations. Therefore, in the United Kingdom, the determination of BAT for energy efficiency by setting standards based on emission limit values (ELVs) is not considered appropriate. Instead they are replaced by equivalent technical measures as determined by appraisal of the appropriate balance between costs of the techniques and the environmental benefits they deliver.

All installations in the United Kingdom under the scope of the IPPC Directive must also meet additional energy efficiency requirements either:

- through participation in a Climate Change Agreement or Direct Participant Agreement in the Emissions Trading Scheme; or
- through compliance with further permit-specific requirements as determined with the regulator.

Lithuania has a plan to develop GBRs for appropriate branches of industry and the requirements of energy efficiency would be included in the rules.

Poland has no general binding rules but is preparing application forms.

4.2 Application documents

Most of the participating countries in this project required the following information from the operator in the application documents: total energy balance, energy production, energy consumption, assessment of energy efficiency, energy saving plan and description of energy use. Earlier saving measures and the amount of energy used for environmental protection measures were not always required. (Annex I, Table 29)

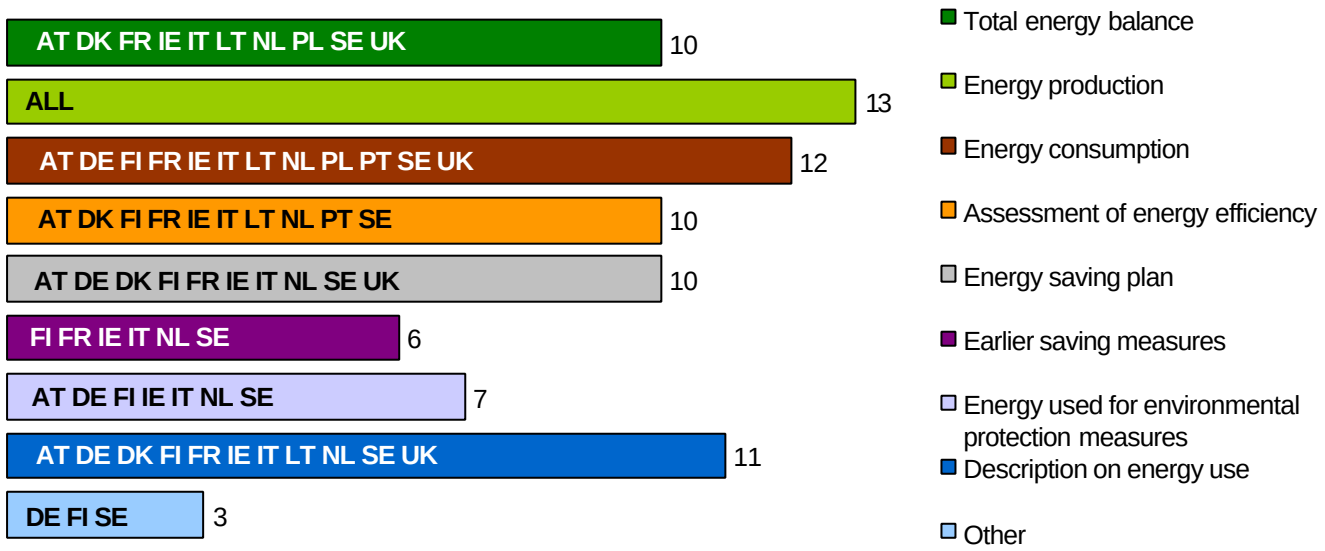

FIGURE 3 (Annex I, Table 29). Information concerning energy required in the application.

4.2.1 Required energy information in the application

Austria requires data on substances used or produced and on energy. Certain discretion is left to the authorities. The following information is important:

- total energy balance
- energy production
- energy consumption
- assessment of energy efficiency
- energy saving plan

- energy used for environmental protection measures and
- description on energy use except data on earlier saving measures.

In Germany all the above mentioned requirements are needed in an application and in addition to these, a declaration of the delivering of usable heat to third parties, if not used in the company itself. The possibilities to achieve high usable energetic ratios and optimisation, energy recovery and insulation measures are required. The effects of energy saving measures are required. Usually no information on voluntary energy saving agreements is required. Application documents for existing installations have to be sent only in the case of planned substantial changes, because Germany does not require new applications for all IPPC installations when implementing the IPPC directive. Germany has guidelines for energy management in companies and guidelines for the applicant on pinch technology for the improvement of energy efficiency. Additionally, Germany wanted the information to be concrete and detailed enough.

In Italy no guidance is available for the applicants at the moment. Some studies have been made (ANPA, ENEA), but most of the guidance will be based on negotiations between applicant and competent authority. Requirements to use energy efficiently are set in permit conditions, but there are not details on how to evaluate the efficient use of energy.

In the Netherlands there are AMVB's General Binding Rules. Larger companies are also advised by Novem. IPPC installations must in their applications provide the following information:

- annual energy saving
- annual saving of energy costs
- company energy plan
- registration of energy use
- reporting obligations that should contain, for example, deviations with respect to the company energy plan.

4.2.2 Other required information

The question of monitoring the effects of measures for energy saving was not quite clear for all the countries. Germany, Ireland, Italy and the Netherlands said that the effects should be monitored. Poland has proposed methods for monitoring technological processes, including measurement and registration of concentration or levels of substances and energy released to the environment. In France there is monitoring of the effects of measures for rational use of energy and investments contributing to rational use of energy. In Lithuania companies are preparing waste reduction plans and in these plans energy saving issues are also described in detail. (Annex I, Table 30)

Most of the participating countries were of the opinion that the information from the voluntary systems can be used in the application documents or in the assessment of an application or as background material. Denmark said that it could be used to verify current effort and status. Germany said that the information has to be concrete and detailed and has to be a declared part of the application document. Ireland uses the information in the application assessment and to set a benchmark against which the company will achieve various objectives and targets. In the Netherlands the energy plans made as part of the agreements are part of the application. In the United Kingdom voluntary energy saving agreements may be used to meet part of the requirements for the IPPC Directive. In addition, each installation has to meet a set of basic energy requirements as a minimum. Italy, Portugal and Sweden said that any relevant information could be used regardless of source. In Sweden the question of how to reduce fossil fuel use is also of interest. (Annex I, Table 31)

Most of the countries saw no differences in the requirements for new or existing installations. However, France said that existing installations must provide a report on past years. In this report there should be an assessment of the effects of the plant on health and the environment during past years, an account of investments to prevent or reduce pollution during past years and the amount of discharges to water or air emissions during the past year. In Germany the application documents for existing installations have to be sent in only if substantial changes are planned and they refer to the parts of the installations where changes are planned. After that there are negotiations between the authority and the operator if some additional documents are required. In Ireland new licences are issued with energy conditions. IPPC installations have to be reviewed once the IPPC directive is introduced in Irish law. (Annex I, Table 32)

4.2.3 Application forms

Finland has a general application form and additionally a form specifically for energy issues with guidance for the operators to fill in when applying for an environmental permit. A group with members from the Finnish environmental authorities and the Confederation of Finnish Industry and Employers developed this form for energy issues. Operators must include on the form (Annex III) information concerning the following:

- total energy balance
- energy production
- energy consumption
- assessment of energy efficiency
- energy saving plan
- energy used for environmental protection measures
- description on energy use
- earlier and planned saving measures and
- planned environmental investments.

The application form and guidance can be downloaded from the Internet. Annex III to this report contains the form.

In Portugal there is an application form for the operator to fill in to apply for an environmental permit. The application form also has some questions regarding energy consumption and energy efficiency, among many other questions related to the installation's activities and emissions (e.g. the quantification of CO_2 emissions). It is not a specific form for energy issues. The form is available on the Internet.

4.3 Permit consideration

4.3.1 Energy efficiency measures in permit consideration

The following guiding principles according to Article 3 of the IPPC Directive must be taken into account by the competent authority when granting a permit:

- appropriate preventive measures are put in place using BAT or other techniques;
- no significant pollution is caused;
- waste is minimised, reused or recycled before being disposed;
- **energy is used efficiently;**
- accidents and incidents with environmental effects are minimised; and
- remediation and restoration measures are in place following cessation of activity.

The IMPEL Workshop on Integrated Permitting in Dublin 2000 also had some key conclusions.

- The permits should be precise and unambiguous.
- The application may or may not be part of the permit.
- All permits should require monitoring by the permitted facility and the regulator should also carry out some monitoring.
- All permits must meet national legislation.
- EMS may or may not be appropriate for all operators.
- Individual environmental media should be addressed under separate headings in the permit.
- The BREF documents will be useful but should be used as guidance only.
- An integrated permit should be all embracing and cover all environmental media.

The environmental authorities take into consideration specific energy saving matters such as choice of fuel, use of electricity, use of heat, process optimisation, index for energy efficiency, use of waste energy, previous measures for energy savings, planned measures for energy savings and planned measures for environmental investments.

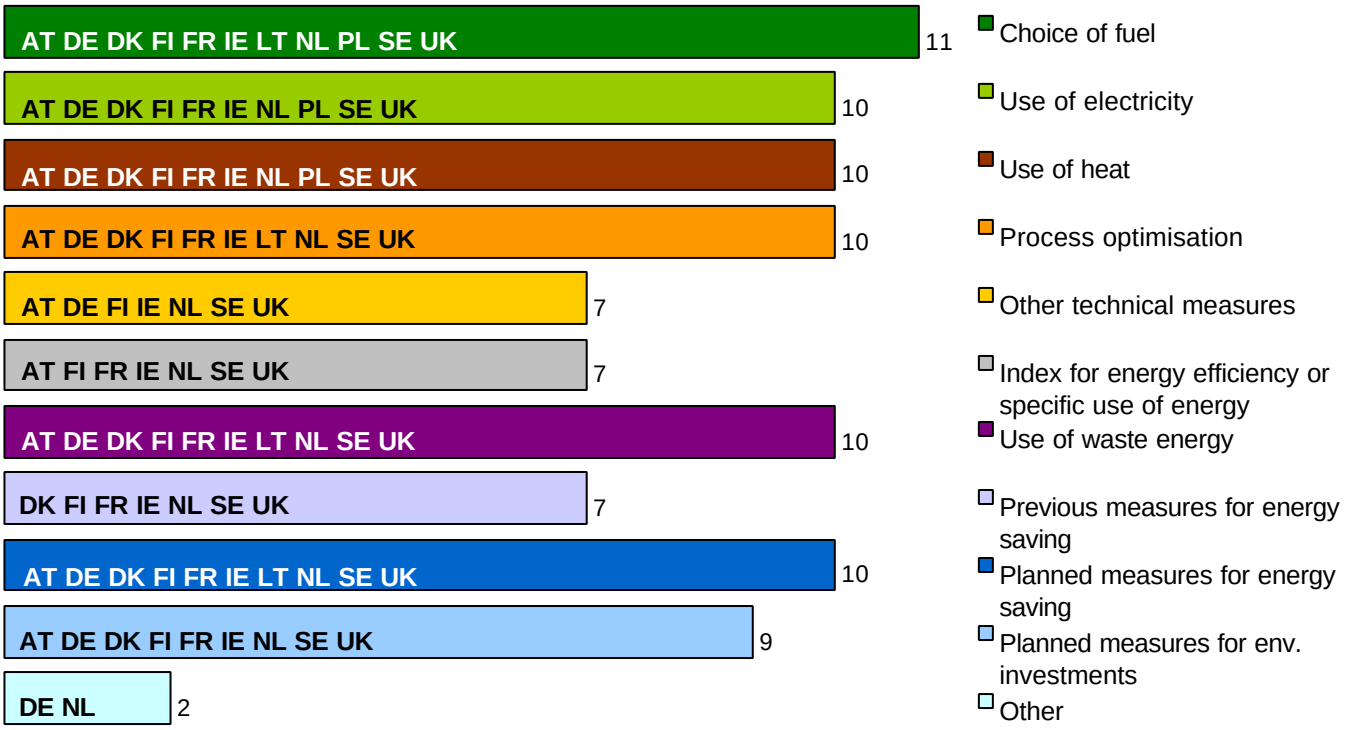

FIGURE 4 (Annex I, Table 34). Specific energy saving matters in permitting.

At the time the questionnaire was sent out there were not many examples of permit conditions including the consideration of energy efficiency. Ireland will carry out a thorough energy audit that will identify all opportunities for energy use reduction and energy efficiency. All the energy specific items are evaluated in the Objectives and Targets by the Irish EPA and in the Annual Environment Report submitted by the licensee to the EPA. In Denmark consideration will be given to co-generation of heat and power if applicable.

In Portugal the operator is required to monitor energy production and usage, and promote an annual self-assessment of energy efficiency (Annex I, Tables 33 and 34). In Portugal the use of waste energy, previous measures for energy savings, planned measures for energy savings and planned measures for environmental investments are also considered when providing grants for industry within several financing programmes.

In their replies most countries said that changes in energy efficiency also could affect the permit and at least lead to a reconsideration of a permit condition. Only Portugal and Finland answered that this is not the case. The requirements for energy efficiency could be incorporated into the permit in different ways; as a binding permit condition, as a general consideration within other permit conditions or as a general consideration in the general part of the permit. All these ways are used equally among the Member States. The most used permit condition is the obligation to improve the energy efficiency. Most of the countries find the BREFs useful when assessing energy efficiency although the data in the BREFs could be improved. A horizontal BREF could also be useful as it might clarify different aspects of energy efficiency.

4.3.2 Other items under consideration when evaluating energy efficiency

In their permits some countries often use references to voluntary energy saving agreements (Finland, the Netherlands and the United Kingdom) or voluntary environmental management schemes (Finland and the Netherlands). Denmark, France, Germany and Lithuania also use references to the application. In Germany permit conditions will be necessary if the operator has to fix other or additional measures than those described in the application documents. In other cases the energy efficiency measures are usually determined by reference to the application documents. (Annex I, Table 33)

Other items that the authority takes into consideration when evaluating energy efficiency could be for example the use of non fossil fuels, transportation, water consumption, air pollution abatement and waste management. The use of non fossil fuels is always taken into consideration whilst transportation is seldom taken into account - only Sweden and the Netherlands consider it. In Sweden energy used in producing raw material or chemicals used might be considered. Sweden also considers issuing permits with permit conditions including specific energy consumption. Water consumption, air pollution abatement and noise abatement are always taken into consideration in the permit procedure because the minimisation of all pollutants is important. (Annex I, Table 35)

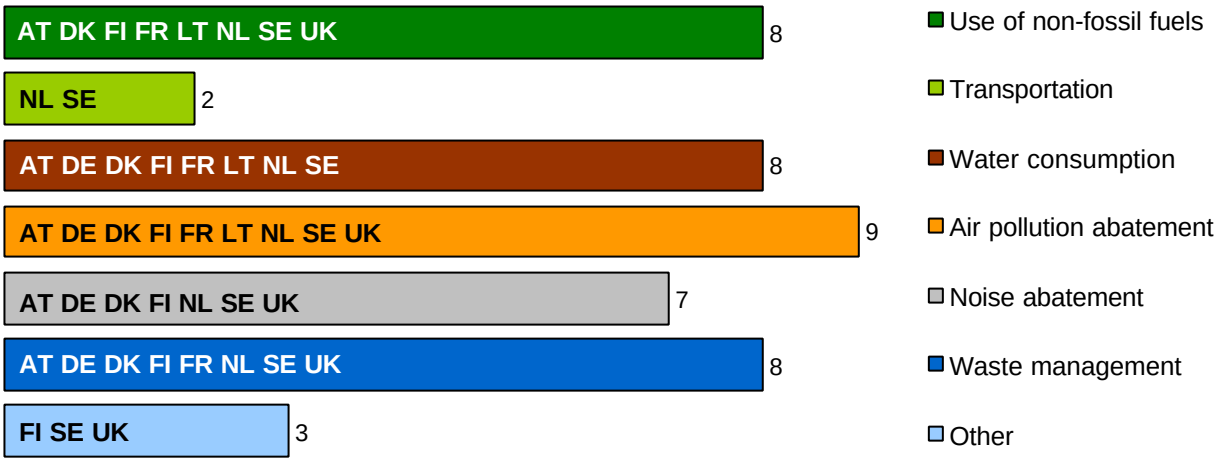

FIGURE 5 (Annex I, Table 35). Other items when evaluating energy efficiency in permitting

Most of the countries have no guidelines on how the choice of fuel shall be handled within the permit consideration. In Germany fuel and emissions from the use of it should also be taken into consideration. Ireland has a BATNEEC Guidance note for each sector. This note supplies information on, for example, what type of fuel should be used. In the Netherlands there are no general guidelines, but minimal CO_2 effects and other emissions such as SO_2 and NO_x are normally considered. (Annex I, Table 36)

Finland said that the cross-evaluation of the effects of the reduction of emissions and wastes in comparison with energy efficiency might be of importance in the permit procedure. The Netherlands and the United Kingdom have some non-binding guidelines for how to deal with co-generation of heat and power in the permit procedure. In the Netherlands the use of residual heat is encouraged and in the United Kingdom, CHP is considered as one of the techniques to improve the efficiency of energy conversion and use. (Annex I, Table 37)

4.4 Permit conditions

4.4.1 Energy efficiency in permitting in practice

In the seminar discussion it was pointed out that the requirement for energy efficiency is as important as the permit conditions on emissions. There are not yet many examples of permits containing consideration of energy efficiency. In general, the countries do not have guidance for the consideration of energy efficiency in the permitting procedure, except for Ireland, the Netherlands and the United Kingdom. Finland, Germany, the Netherlands, Poland, Sweden and the United Kingdom could foresee the requirement for energy efficiency as a binding permit condition.

Most of the countries considered the following items as important when evaluating energy efficiency in the permit procedure (Annex I, Table 34):

- choice of fuel;
- use of electricity;
- use of heat;

- process optimisation;
- other technical measures;
- index for energy efficiency or specific use of energy;
- use of waste energy;
- previous measures for energy savings;
- planned measures for environmental investment and, if applicable and
- possible co-generation of power and heat is important.

In Germany there are usually references to the application. However, permit conditions will be required if the authority has to fix other or additional measures than those described in the application documents. If applicable, co-generation of power and heat is also taken into consideration in permitting.

In Finland there is a permitting guidance under development in which the issue will be addressed. Additionally, also in the Finnish environmental permits there could be references to the application. In cases where the installation has joined the energy saving agreement no further energy efficiency conditions are set in the permits.

In France there are "Provisions about rational use of energy in classified installations for environmental protection regulations". In the ministry decision on the glass industry it is a requirement that the plant manager must take all necessary measures in the design and the management of the plant to limit energy consumption. He must make available for the environment inspector the reasons explaining the choice of energy sources as well as information about the energy efficiency of the installations. In the ministry decision on the paper industry it is required that the plant manager must take all necessary measures in design and management of the plant to reduce air pollution at the source, in particular by optimising energy efficiency.

In France the efficient use of energy in a plant is mainly studied when designing the plant together with the impact study, at the decennial assessment of the permit or during energy audits on a voluntary basis. France has a Decree on the Periodic Control of Installations consuming Energy in which the following terms are defined: boiler, nominal power and characteristic yield. Periodic control comprises:

- calculation of the yield characteristic of the boilers;
- control of the existence and the correct operation of the control and measuring apparatus;
- checking of the good condition of the installations intended for the distribution of thermal energy;
- checking of the quality of the combustion and the correct operation of the boilers; and
- checking of the boiler manual.

The periodic controls are carried out at the expense of the owner of the thermal installation.

In Ireland the current permits often have a condition that requires the activity to carry out a thorough energy audit that will identify all opportunities for energy use reduction and energy efficiency. The Netherlands thought that benchmarking is a good way forward, at least for the most environmentally aware companies. In the United Kingdom an energy efficiency implementation plan should be attached to the permit. The most difficult question is whether the authorities can set limit values for energy efficiency. The general opinion was that there could be no restrictions on energy consumption as such and that it is difficult to have binding conditions. The linkages between the permits and the voluntary energy saving schemes were seen as useful. The checking of energy use could be done through annual monitoring.

In Lithuania there are requirements for energy use and references to the application in the permits. In Poland the permit must specify, in particular, the type and quantity of consumed energy, materials, raw materials and fuels, the sources of origination, of substances, and energy releases to the environment.

Portugal has limited experiences so far with permitting IPPC installations. The use of waste energy, previous measures for energy savings, planned measures for energy savings and planned measures for environmental investments are also considered when providing grants to industry within several financing programmes with the objective to improve energy efficiency.

4.4.2 Some examples of permit conditions

For Finland two types of permit conditions can be mentioned:

For an IPPC chemical plant in Finland:
In the operation and planning of the installation the most efficient use of energy and continuous improvement of energy efficiency shall be taken into consideration. The operator shall before 31 December 2003 present to the environmental authority an assessment of the present energy efficiency of the installation, the plan for monitoring the efficiency and consideration of it in the operation as well as the goals for the future. The authority will check the report and do an assessment of the improvement of energy efficiency and the necessity of the measures for monitoring.

For a small metal plant in Finland:
The results of the energy inspection and analysis and the plan for more efficient energy production and use must be sent for acceptance to the environmental authority before 1 June 2001. In the improvement plan there must be at least goals for improvement and the costs of the measures and a timetable for the measures.

In France the permit for a boiler (68.2 MW) has, for example the following permit conditions. The most significant conditions with respect to the effective use of energy are mentioned, but are in unofficially translation into English.

Each generator must be provided with the following apparatuses:
- a recording vacuum gauge;
- an indicator of the temperature of combustion gases on the outlet side of the generator;
- a temperature sensor of the fluid at the entry and exit of each boiler room;
- a device indicating the thermal parameters of the coolant to the entry and the outlet side of each generator;
- an apparatus measuring continuously the index of blackening;
- a device indicating either the flow of fuel or flow of the coolant; and
- an automatic analyser of combustion gas giving at least the content of carbon dioxide or any equivalent indication.

The condition on management states that a manual on heating must be held and that it shall contain at least information on
- general conditions of the use of heat;
- results of controls of the combustion and the operation of the apparatuses and of modifications to combustion and controls; and
- yearly fuel consumption.

The operator shall take all measures to ensure, for example:

- a periodicity determined for the cleaning of the heat-transferring surfaces
- an effective heat insulation of elements of generators, appliances as well as of transport or distribution pipes.

In France the minimum boiler yield should be between 85 and 90 % based on the fuel used in the boiler when the boiler yield is defined as $R = 100 – (Pf + Pa + Pr)/Pin$

- Pf is the loss of energy through the fumes
- Pa is the loss of energy in the ashes
- Pr is the energy lost through convection and radiation
- Pin is the input of energy expressed as low heating value

In Germany there could be a condition such as the applicants documents are declared an integrated part of the permit. That means that the applicant is legally bound to each detail in that document. The document must show concrete, detailed and specific energy efficiency.

In Ireland the permit template has a condition that requires the activity to carry out a thorough energy audit that will identify all opportunities for energy use reduction and energy efficiency. This information is submitted to the agency in an annual environmental report (AER).

The Irish wording for a permit condition is as follows:
"The licensee shall carry out an audit of the energy efficiency of the site within one year of the date of grant of this licence. The licensee shall consult with the Agency on the nature and extent of the audit and shall develop an audit programme to the satisfaction of the Agency. The audit programme shall be submitted to the Agency in writing at least one month before the audit is to be carried out. A copy of the audit shall be available on-site for inspection by authorised persons of the Agency and a summary of the audit findings shall be submitted as part of Annual Environmental Report. The energy efficiency audit shall be repeated at intervals as required by the Agency.

The audit shall identify all opportunities for energy use reduction and efficiency and the recommendations of the audit will be incorporated into the Schedule of Environmental Objectives and Targets under Condition 2.2 above."

In Portugal the operator has to monitor the energy consumption and send the results to the authority. He has also to evaluate energy efficiency and is required to develop actions aiming to obtain maximum energy efficiency. Usually the requirement for energy efficiency is incorporated as a general consideration in the descriptive part of the permit. In future when the BREF documents for energy intensive installations have values for energy consumption the requirement for energy efficiency may be incorporated into the permit as a binding permit condition.

Examples from two **Swedish** Environmental Court Decisions and three statements of the Swedish EPA:

Swedish example I:
"The company shall in co-operation with the supervising authority and the Swedish Environment Protection Agency conduct the following investigations and illustrate the impact on cost and environment of the considered measures:

1. As regards energy conservation:
   Possibilities to

a) Reduce consumption of energy in the installation through savings
b) Further use of low-heat energy for district heating purposes
c) Substituting hydrogen gas or steam bought from the neighbouring pulp mill for oil

2. As regards transportation:
   Possibilities to reduce environmental impact from transportation by changing over to railway transportation, (and introducing) requirements when contracting transportation etc.

The investigations together with proposals for measures and final conditions shall be presented to the environment court before 1st of January 2004."

Swedish example II:
"The company shall elaborate a long term plan for conservation of energy and present it to the regional state authority by 30th of September 2002 at the latest"

In the following three statements issued by the Swedish EPA to environment courts:
Note that the courts have not yet given their rulings on the proposals. The decisions are expected by the end of 2002.

Swedish EPA statement I:
For one permit application for a pulp mill the Swedish EPA has proposed the following conditions:

1. Before the end of 2005 production of electricity and of low pressure steam shall have increased on the whole as described in annex A point 7.1 in the company's application dated 16th of March 2001, "increased dryness of black liquor". The measure should thus aim at increasing production of electricity by about 5 700 MWh/year and of low pressure steam by about 48 000 t/year.
2. Before the end of 2005 the consumption of heat energy in the evaporation plant shall be reduced on the whole as described in the additional information from the company dated 28th of November 2005 under point 15, "Ecocyclic mill". The measure should thus aim at reducing the total energy consumption in evaporation and stripper to about 4 GJ/t bleached pulp.
3. Before the end of 2005 the energy consumption in the drying machine shall be reduced as a whole as described in the company's additional information dated 28th of November 2005 under point 8, "Drying machine, dryness". The measure should thus aim at reaching a net steam consumption in the drying machine of about 2.1 GJ/tonne."

Swedish EPA statement II:
In another case the Swedish EPA has proposed that the following investigations be carried out:
"The company shall investigate different possibilities for and consequences of

1. Taking measures, which at the production levels applied for, reduce the consumption of electricity by about 20 % compared to what is stated in the application.
2. Taking measures which increase production of electric energy with the purpose of being 50 respectively 75 % self sufficient with electricity at the production levels applied for."

The Swedish EPA moreover proposed the following final conditions:

1. Before the end of 2005 the capacity of the auxiliary boiler when fuelling bark is to be increased as described in the court's file annex 61 under point C.5 or in another equivalent manner, which the supervising authority deems as promoting a sustainable development in an equivalent or better way.
2. Before the end of 2005 the existing flash drier is to be replaced by a modern drying machine.

3. Before the end of 2007 the use of oil in the limekiln is to be replaced with bark powder or gasified bark.

Swedish EPA statement III:
In a third ongoing case the applicant has accepted the following condition for an investigation on energy efficiency to be carried out together with the supervising authority during one year:

"The report (to the court) from the investigation shall comprise an account of the energy efficiency development at the installation, a comparison with the development at other known similar activities in Sweden, a comparison with the BAT document that has been elaborated within the EU, an account of the potential for further measures at the installation and proposals for conditions for energy conservation"

The United Kingdom has been considering a legal instrument by which Regulators can incorporate negotiated agreements and trading agreements into IPPC permits. Although as yet not finalised, draft permit conditions may include the following requirements:

- annual reporting of energy consumption, direct and indirect carbon dioxide emissions;
- compliance with a set of basic energy efficiency requirements;
- the holding of a current negotiated agreement or trading agreement validated by the relevant government ministry; and
- if no such agreement is held, compliance with site-specific energy efficiency measures.

4.5 Best Available Technique (BAT) in the permit procedure

A Best Available Techniques Reference document (BREF) is the product of an exchange of information carried out in the European IPPC Bureau with a dedicated Technical Working Group (TWG) constituted for the purpose. In total there are 32 industrial sectors for which these BREFs have to be established. Eight of them have already been adopted by the European Commission and four finalised BREFs are awaiting adoption at the moment (November 2002). A TWG for a horizontal energy efficiency BREF is planned to be established in 2003.

The term "best available techniques" is defined in Article 2(11) of the IPPC directive as follows:

> "The most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole."

Article 2(11) goes on to clarify further the definition of the words "techniques", "available" and "best". The contents of the BREFs are presented in more detail in Chapter 5 "Best available technique reference documents and energy efficiency". This chapter is based on the replies to the questionnaire.

A very clear perception concerning the usefulness of the BREFs when assessing energy efficiency is that very few of them contain specific enough data. However, BREFs for the cement and lime, chlor-alkali, non-ferrous metals and pulp and paper industries were mentioned as useful examples. In general BREFs can be useful for the authority as guidance documents representing the minimum demands, but they should be improved in terms of energy efficiency. Nearly all of the participating countries indicated that the sector-specific BREFs should contain more information on energy effi-

cient techniques and energy consumption, for example kWh/t per produced unit at best performing installations. (Annex I, Tables 43 and 47)

Seven out of ten countries wish better information about a consistent basis for energy reporting and also consideration of trade-offs between energy use and other environmental impacts. There were other suggestions too on ways to improve the BREFs, for example, energy aspects should be dealt with more comprehensively way mainly in sector-specific BREFs and a horizontal BREF should only contain general principles and techniques (Austria). Portugal suggested clarification of the use of different methods for assessing the energy efficiency in specific situations or alternatively its consideration in the monitoring BREF. Sweden would like to see more data on energy production possibilities at the installations and on the possibility to use excessive heat, for example, for district heating perhaps after heat-pumps. (Annex I, Table 47)

It seems that there has been to systematic comparison and evaluation of possible differences between the BREFs on concerning energy efficiency in new and existing installations. The general opinion is that there should be no major differences because the data in the BREFs are based on well-performing existing installations and reflect the BAT for the sector. Portugal refers to the cement and lime industry BREF, where the heat balance value associated with BAT is only valid for new plants and major upgrades. Existing installations use the parameters given in the BREFs as targets (Lithuania). The United Kingdom points out that it seems to be more relevant to list energy efficiency parameters and other related issues for different technology types and then to consider which technology would be chosen for the new installation. (Annex I, Table 44)

None of the participants in this project, except Lithuania, consider the energy efficiency data as sufficient in the BREFs, neither for new nor existing installations. There just is not enough data, nor is the information specific enough. The BREFs are only guidance documents, which should be taken into account (Sweden). Portugal's proposal is that the content of the BREFs could be made more readable and uniform. All the values indicated should be clearly presented as benchmarks to the sector and, if possible, specified for each process. Especially for new installations there should always be an energy efficiency value attainable with the suggested BATs. (Annex I, Table 45)

As mentioned above, there are several problems with the use of BREFs concerning energy efficiency. Additional comments on this issue are, that the BREFs suffer from a lack of comparable data (Finland), because industry tends to keep energy data secret (Sweden). It should also be noted that some techniques, for example emission reduction processes, often increase energy consumption (France, Germany and Portugal). The BREFs could also deal more in detail with the integration of energy efficiency and the reduction of greenhouse gases (the Netherlands). Two countries, Denmark and Portugal, would like to see all of the BREFs revised due to the lack of different energy efficiency issues. The specific BREFs proposed for revision are cement and lime (Austria and Portugal), pulp and paper (Austria) and glass (Portugal). (Annex I, Tables 46 and 48)

A new horizontal BREF on energy efficiency techniques would be useful according to the replies from eight countries. It should clarify the different aspects of energy efficiency and give some examples on national guidance (Finland). Many of the countries also criticise a possible horizontal BREF because most of the problems are too much sector related or technology specific to be treated properly at a horizontal level (Austria, France, Germany and Sweden). Such a document could give good guidance on principles and definitions for the authorities (Germany), but the experience from horizontal BREFs so far is not very encouraging in terms of usefulness (Sweden). The United Kingdom has already produced this sort of national guidance. (Annex I, Table 49)

Other international BAT-related documents – recommendations of the Paris Commission (PARCOM) and Helsinki Commission (HELCOM) and Nordic BAT documents – are in use in only three countries participating in this project: Finland, France and Lithuania use at least one of these documents when evaluating BAT for energy efficiency. Finland suggests in its reply that the Nordic BAT documents and communication between the countries could be used more than at present. There are national sector-wise evaluation of BAT including energy efficiency in the Netherlands and Germany. In the Netherlands there are technical information sheets concerning energy measures for those branches or installations, which are not participating in the benchmarking or long term (MJA) agreements. Germany has binding guidelines only for specific industries, for example steel mills. Italy is at present working on developing sector-wise guidelines and Portugal will soon start working on evaluating the adequacy of the BATs to industry. Finland has already published an expert report on BATs in large combustion plants. (Annex I, Tables 50 and 51)

5 BEST AVAILABLE TECHNIQUE REFERENCE DOCUMENTS AND ENERGY EFFICIENCY

The goal of this chapter is to present the most important information and aspects concerning energy efficiency found within the Best Available Techniques Reference Documents (BREF). There are 32 industrial sectors for which these BREFs have to be established until 2004/2005. Until now (November 2002), only eight BREFs have been adopted. Consequently, all the information and data within this summary are based on only these eight documents. Nevertheless, a general tendency can be recognised because of the diversity of the analysed industrial sectors. These BREFs include the following industries:

- cement and lime industry, March 2000 (mentioned in this chapter as BREF 1)
- iron and steel production, March 2000 (BREF 2)
- non-ferrous metals industry, May 2000 (BREF 3)
- pulp and paper industry, July 2000 (BREF 4)
- chlor-alkali manufacturing industries, October 2000 (BREF 5)
- ferrous metals processing industry, October 2000 (BREF 6)
- glass manufacturing industries, October 2000 (BREF 7)
- cooling systems, November 2000 (BREF 8).

First there is a description of some general aspects concerning energy (5.1–5.4). A detailed summary for each industrial sector can be found in Sections 5.5–5.12. The table in Section 5.14 shows the most important aspects concerning energy efficiency. Within the summaries there is a basic structure that is applied also in the table. The main focus has been put on the energy related aspects found in the BREFs for each industrial process in the different sectors. Other criteria include the importance of energy, the most important techniques or processes concerning energy, and energy saving and energy recovery techniques, the availability of data, individual aspects, and future recommendations.

It should be noted that all the information and descriptions from the BREFs and obviously also from this report are incomplete and, therefore, are given for information purposes only. The information has no legal value and does not in any way alter or prejudice the actual provisions of the IPPC directive.

5.1 General findings

For energy consumption, energy recovery and energy savings the amount of information found in the BREFs is considerable. There are some fluctuations between the different documents, but this depends mainly on the importance of energy use within the individual industrial sectors. In almost every BREF, energy use and emissions to air belong to the main environmental issues. In some cases the main focus is on air pollution abatement and little information on energy is available.

Sector-specific BREFs give technical information and data on emissions and consumption levels to be used when assessing energy efficiency. In some sector-specific BREFs the energy data is very detailed and well structured. There is even guidance and a description on how to calculate the relative conservation of energy (BREF 8, Annex II, 161–177). On the other hand, there are BREFs where it is rather complex to collect and organise the information, so that it is difficult for the reader to keep track of it.

Application of energy efficient methods is not always unambiguous. In some processes the techniques applied require certain arrangements or in some cases the demands set for the raw materials also give some restrictions. Possibilities for application of energy efficient methods depends greatly on the possibilities given by the individual industrial sectors and the processes applied.

Use of emissions abatement techniques increases energy consumption. A balance between the level of emission reduction and energy savings has to be considered case by case. This is important e. g. for the ferrous and non-ferrous metals industries, where many emission abatement techniques are highly energy intensive.

5.2 Importance of energy

Almost every industrial sector is considered to be a high consumer of energy. In extreme cases energy is a major input, accounting for 50 % of total production costs. However, the level of description of energy efficiency varies between each sector. This does not mean that all industries which consume a lot of energy, are necessarily energy inefficient. For example, the pulp and paper industry is a large consumer of energy, but it has made a lot of progress during the last few years in implementing new economical technologies and energy saving techniques. In some cases, where a combined heat and power plant (CHP) has been installed, it may even produce more electrical energy than actually needed. Another good example is the integrated pulp and paper mills where a great part of the energy is recovered from the liquid residue (black liquor).

It should be noted that almost every industrial sector is really interested in reducing its energy consumption. Energy causes high production costs, so it is a very important financial aspect which has to be considered by the companies.

5.3 Energy consumption

Energy consumption is described extensively and consumption data are given for almost every industrial sector. In a few sectors, data are available even for several single processes. There is much more information about consumption levels than about recovery or savings quantities. Some industries use both heat energy and electrical power. Others are either using electrical energy or heat energy. Heat is usually generated in burners, boilers, kilns or furnaces using different kinds of fuels. The related processes are burning, melting and heating. They are used mainly in the glass, ferrous metals, iron and steel industries. The unit is given in MJ/t of product or GJ/t of product.

Electrical energy is needed in the chlor-alkali sector, as well as in several other processes in different industrial sectors. The unit is kWh/t of product or ACkWh/t of product.

5.4 Energy savings and recovery techniques

The information regarding energy saving or energy recovery techniques varies from limited to excellent. This subject is handled in many different ways, probably related to the importance of the individual sector. In some documents energy saving methods are hardly mentioned.

For the pulp and paper sector, as well as for the ferrous metals processing sector, the availability of information concerning energy savings is largely considered excellent (BREF 4, 271–292; BREF 6,

111ff). The energy data are well structured and many aspects, such as the applicability of the measure or technique, the highest level of environmental performance achieved and the economic benefits, are described accurately.

Generally, the level of description of savings and recovery techniques and especially the associated energy values are insufficient and incomplete. This problem is also seen when analysing the recommendations for the future in each BREF.

5.5 Cement and lime industry

Importance of energy efficiency

The cement and lime industry is an energy intensive industry with energy typically accounting for 30–50 % of production costs (that is excluding capital costs). The key environmental issues associated with cement and lime production are air pollution and the use of energy.

Most important processes/technologies related to energy efficiency

The clinker-burning process (for cement), or the lime-burning process, is the main source of emissions and is also the principal user of energy. The primary use of energy in cement manufacturing is as fuel for the kiln. The major users of electricity are the mills and the exhaust fans, which together account for more than 80 % of electrical energy use. On average, energy costs – in the form of fuel and electricity – represent 50 % of total production cost involved in producing a tonne of cement. Electrical energy represents approximately 20 % of this overall energy requirement.

The theoretical energy use for the burning process (chemical reactions) is about 1 700 to 1 800 MJ/t clinker. The actual fuel energy use for different kiln systems is about 3 000 to 6 000 MJ/t clinker.

The electricity demand is about 90–130 kWh/t cement (BREF 1, 23). The heat and electrical power use for calcining of limestone by lime kiln depends on the given kiln type, on the quality of the stone used and on the degree of conversion of calcium carbonate to calcium oxide.

The heat of dissociation of calcium limestone is 3 200 MJ/t. The net heat use per tonne of quicklime varies considerably with kiln design. Rotary kilns generally require more heat than shaft kilns. The heat use tends to increase as the degree of burning increases.

The use of electricity varies from a low range of 5–15 kWh/t of lime for mixed-feed shaft kilns, to 20–40 kWh/t for the more advanced designs of shaft kiln and for rotary kilns (BREF 1, 80).

Energy recovery or energy saving techniques for the main processes

There are some energy saving and energy recovery techniques for the main processes in the cement and lime industry, principally for the clinker- and lime-burning processes. These techniques also have to be considered in the determination of BAT, so they will be described later in this chapter.

Energy data and energy saving techniques for other processes

There are two more processes in the lime industry which have to be mentioned because they are not irrelevant to energy consumption: lime hydrating and lime grinding. For lime hydrating, the energy

requirements to operate the hydrators, air classifiers and conveying equipment amount to approximately 5–30 kWh/t of quicklime.

The energy use for lime grinding varies from 4–10 kWh/t of quicklime for the coarser grades to 10–40 kWh/t of quicklime for the finer grades. The amount of energy required also depends on the equipment used (BREF 1, 81).

Best available techniques (BAT)

Principally there are two different types of techniques, those which have to be considered in the determination of BAT (techniques not yet considered BAT) and others which are already considered as BAT. For the cement and lime industry these techniques are almost the same. Further, it is possible to divide the BATs into general techniques (primary measures) and more process specific ones.

General BAT (cement industry)

The following measures can be considered as general techniques (primary measures) (BREF 1, 48):

A smooth and stable kiln process:
- Process control optimisation, including computer-based automatic control systems
- The use of modern, gravimetric solid fuel feed systems

Minimising fuel energy use by means of:
- Preheating and precalcination to the extent possible, considering the existing kiln system configuration
- The use of modern clinker coolers enabling maximum heat recovery
- Heat recovery from waste gas

Minimising electrical energy use by means of:
- Power management systems
- Grinding equipment (high-pressure grinding rolls for clinker comminution) and other electricity based equipment with high energy efficiency

Process specific BAT (cement industry)

For new plants and major upgrades the best available technique for the production of cement clinker is considered to be a dry process kiln with multi-stage preheating and precalcination. The associated BAT heat balance value is 3 000MJ/t clinker.

General BAT (lime industry)

The following measures can be considered as general techniques (primary measures) (BREF 1, 94):

A smooth and stable kiln process:
- Process control optimisation.

Minimising fuel energy use by means of:
- Heat recovery from exhaust gases to preheat the water for hydration of lime.

Minimising electrical energy use by means of:

- Utilisation of mills and other electricity based equipment with high energy efficiency (high pressure roll mills).

Process specific BAT (lime industry)

Replace or modify old kilns to reduce fuel energy use. Such modification range from minor modification (installation of heat exchangers) to major changes in the configuration of the kiln.

Specific aspects for energy saving and energy recovery measures

There were no specific aspects concerning savings or recovery measures mentioned.

Recommendation for the future

It could be useful to do a survey of the current abatement techniques, emissions and consumption and monitoring in the lime industry.

5.6 Iron and steel industry

Importance of energy efficiency

The iron and steel industry is a highly material- and energy-intensive industry. Additionally, emissions to the air and solid waste and by-products belong to the main environmental issues.

Most important processes/technologies related to energy efficiency

In this BREF the principal ways of steel making are presented, namely in integrated steelworks and in electric arc furnaces. Because of the complexity of integrated steelworks, the main production steps (sinter plants, pelletisation plants, coke-oven plants, blast furnaces and basic oxygen steel making, incl. casting) are described separately. Therefore, all these production steps have to be considered important as regards energy efficiency.

However, the most energy consuming process unit in iron and steel production is the blast furnace. For a blast furnace using coal injection and top gas pressure recovery for electricity generation the total energy input amounts to 18.67 GJ/t pig iron (subdivided in coke = 12.4, powdered coal = 1.63, hot blast 4.52 and electricity 0.12) (BREF 2, 191).

The range of energy use within the sinter plants is about 1 125–1 920 MJ/t sinter (thermal energy) with an average consumption of 1 480 MJ/t sinter. Coke is the dominant sinter plant energy input (about 85 %), with electricity and gas supplying the remainder in equal amounts (BREF 2, 44).

In pelletisation plants, energy consumption differs depending on the type of plant. If the pelletisation plant is part of an integrated steelwork, the following energy consumptions are possible: coke oven gas (COG) 398.7 MJ/t, natural gas 209 MJ/t, coke 283 MJ/t. With stand-alone pelletisation plants, energy consumption is less: coal 213–269 MJ/t, oil 38–171 MJ/t (BREF 2, 95). Electricity varies from 51 MJ/t to 128 MJ/t independent of the type of plant.

In coke-oven plants energy consumption can be 3 200–3 900 MJ/t (blast furnace gas + COG) and 20–170 MJ/t (electricity). An energy balance for a coke-oven plant (without COG treatment) shows that with an input of 43 GJ/t coke the energy loss will amount to 3.33 GJ/t (< 10 %) (BREF 2, 122, 127–128).

In the basic oxygen furnace (BOF), fuel is consumed to preheat and dry the converters after relining and repair. This thermal energy consumption is approximately 0.051 GJ/t liquid steel (LS). Electricity consumption is estimated at 23 kWh/t LS or 0.08GJ/t LS (BREF 2, 242).

Electric steel making is usually performed in an electric arc furnace (EAF). This furnace plays an important and increasing role in modern steel works in the European Union (35.3 % of the overall steel production). The total energy consumption amounts to 2 300–2 700 MJ/t (BREF 2, 281).

Energy recovery or energy saving techniques for the main processes

For blast furnaces the following process-integrated measures belong to energy recovery or energy saving techniques (BREF 2, 194–198):

- Direct injection of reducing agents
  Energy savings can amount to 0.68 GJ/t pig iron or 3.6 % of the gross energy consumption of the blast furnace.
- Energy recovery from blast furnace gas
  Approximately 5 GJ/T pig iron or 30 % of the gross energy consumption of the blast furnace.
- Energy recovery from top gas pressures
  Energy savings are estimated at up to 0.4 GJ/t pig iron for a 15 MW turbine, which correspond to 2 % of the gross energy consumption of the blast furnace.
- Energy savings at the hot stove
  About 0.5 GJ/t pig iron energy savings possible.

Within the sinter plants the following technique can be considered as an energy recovery technique:

- Heat recovery from sintering and sinter cooling (BREF 2, 53–54)
  The recovered heat amounts to 30 % of the input heat. Two kinds of potentially reusable waste energy are discharged from the sinter plants: the sensible heat from the main exhaust gas from the sintering machines, and the sensible heat of the cooling air from the sinter cooler. The amount of waste heat recovered can be influenced by the design of the sinter plant and the heat-recovery system:
  - Sinter cooler waste heat recovery with conventional as well as Eos-sintering
  - (energy recovery = 18 % of the total energy input for the waste heat boiler)
  - Sinter cooler and waste gas heat recovery with sectional waste gas recirculation
  - (energy recovery = 23.1 % of the total energy input)
  - Strand cooling and waste heat recovery with partial waste gas recirculation

The following technique can be considered as an energy recovery technique in pelletisation plants (BREF 2, 99):

- Recovery of sensible heat from induration strand
  Approximately 67.5 MJ/t pellet or 4 % of gross energy consumption.

There are no energy saving techniques mentioned for coke-oven plants.

For the basic oxygen steel-making process the following techniques have to be considered as regards energy recovery and savings (BREF 2, 244-246):

- Energy recovery from the BOF gas
  When the energy from the BOF gas is recovered (waste heat recovery and/or BOF gas recovery), the basic oxygen furnace becomes a net producer of energy. In a modern plant, energy recovery can be as high as 0.7 GJ/t LS.

In the electric steel-making industry, several energy recovery and energy saving techniques are available (BREF 2, 295–301). The most important are:

- EAF process optimisation
- Scrap preheating.

Energy data and energy saving techniques for other processes

Because of the complexity of integrated steelworks and the structure of the iron and steel BREF, all relevant processes are discussed together with the most important one (blast furnaces) in the sections above.

Best available techniques (BAT)

Principally there are two different types of techniques, those which have to be considered in the determination of BAT (techniques not yet considered BAT) and others which are already considered as BAT. In the iron and steel production industry these techniques are almost the same. All the techniques described above can be considered in the determination of BAT. In this section a short summary of the BATs concerning energy are presented.

Process specific BAT for blast furnaces

- Blast furnace gas recovery
- Direct injection of reducing agents
- Energy recovery of top blast furnaces gas pressure where prerequisites are present
- Hot stoves (where design permits).

Process specific BAT for sinter plants

- Recovery of sensible heat.

Process specific BAT for pelletisation plants

- Recovery of sensible heat.

Process specific BAT for basic oxygen steel making and casting

- BOF gas recovery and primary de-dusting.

Process specific BAT for electric steel making and casting

- Scrap preheating in order to recover sensible heat from primary off gas.

Specific aspects for energy saving and recovery measures

The information concerning energy recovery or energy saving techniques is well presented and well structured.

5.7 Non-ferrous metals industry

Importance of energy efficiency

Energy consumption and the recovery of heat and energy are important factors in the production of non-ferrous metals. They depend on the efficient use of the energy content of sulphidic ores, the energy demand of the process stages, the type and supply method of energy used and the use of effective methods of heat recovery. There is a steady improvement in the environmental performance and energy efficiency of the industry over the last 25 years. The recycling performance of the industry is unmatched by any other industry.

Most important processes/technologies related to energy efficiency

The most important processes and techniques within the non-ferrous metals industries related to energy efficiency are pyrometallurgical processes. They are highly heat intensive and the process gases contain a lot of energy.

Energy recovery or energy saving techniques for the main processes

There are a lot of energy saving techniques described for the pyrometallurgical processes. A few examples are listed below:

- The steam produced can be used to produce electricity and/or for heating requirements.
- Use of the excess heat to melt secondary materials without the use of additional fuel.
- Use of oxygen enriched air or oxygen in the burners to reduce energy consumption by allowing autogenic smelting or the complete combustion of carbonaceous material.
- Separate drying of concentrates at low temperatures reduces the energy requirements.
- Heat recovery by using hot gases from melting stages to pre-heat the furnace charge. The recovered heat is approximately 4–6 % of the furnace fuel consumption.
- Collecting and burning carbon monoxide (produced in electric or blast furnaces) as a fuel for several different processes or to produce steam or other energy.
- Re-circulation of contaminated waste gas back through an oxy-fuel burner has resulted in significant energy savings.
- Use the heat content of process gases or steam to raise the temperature of leaching liquors.

Energy data and energy saving techniques for other processes

There is a lot of information concerning energy consumption for the production of different non-ferrous metals. Basically these metals are divided into ten groups and described separately. The following information is intended as an overview.

Copper:	The energy use of the electrolytic process is most significant. The production energy (net) requirement for a number of processes using copper concentrate is in the range 14–20 GJ/t copper cathode. The energy consumed by the electro-refining stage of copper production is reported to be 300–400 kWh/t of copper (BREF 3, 214).
Aluminium:	The main cost of producing primary aluminium is electricity (about 30 % of production costs). A typical range for energy consumption is 8–13.5 GJ/t aluminium (BREF 3, 283–284).
Lead and zinc:	The energy consumption for the different lead and zinc processes varies to a large extent. Electricity is used for most of the processes (BREF 3, 359).
Ferro-alloys:	The ferro-alloys industry is a major consumer of energy. The laws of thermodynamics limit the reduction of energy necessary for the smelting process. The reduction of the overall energy consumption is therefore in most cases only possible by using an efficient energy recovery system (BREF 3, 528–532).

Nickel: The energy used for the production of matte from sulphidic ores is reported to be in the range 25–65 GJ/t of nickel for ores containing 4–15 % Ni. The energy used in the various refining stages is reported to be 17–20 GJ/t of Ni (BREF 3, 631).

Ferro-alloy production is a high energy consuming process, because high temperatures are needed for the reduction of metal oxides and for smelting. In the non-ferrous metal BREF several different measures for energy recovery and the use of the recovered energy are listed (BREF 3, 546–548).

Best available techniques (BAT)

Principally there are two different types of techniques, those which have to be considered in the determination of BAT (techniques not yet considered BAT) and others which are already considered as BAT. For the non-ferrous metals industry the BAT conclusion for energy recovery are:

- Production of steam and electricity from the heat generated in waste heat boilers.
- The use of the heat of reaction to smelt or roast concentrates or melt scrap metals in a converter.
- The use of hot process gases to dry feed materials.
- Pre-heating of a furnace charge using the energy content of furnace gases or hot gases from another source.
- The use of recuperative burners or the pre-heating of combustion air.
- The use of the CO produced as a fuel gas.
- The heating of leach liquors from hot process gases or liquors.
- The use of plastic contents in some raw materials as a fuel, provided that good quality plastic cannot be recovered and VOCs and dioxins are not emitted.
- The use of low-mass refractories where practicable.

Specific aspects for energy saving and energy recovery measures

Most of the energy recovery or energy saving methods are site specific; therefore, not every technique can be implemented. Especially the techniques to recover heat vary from site to site. A number of factors are involved here, such as the potential uses for heat and energy on or near the site, the scale of operation, and the potential for gases or their constituents to foul or coat heat exchangers.

Recommendation for the future

Additional efforts should be made to establish a basis of information including specific emission and consumption data. Energy usage should also be reported on this basis.

5.8 Pulp and paper industry

Importance of energy efficiency

The manufacturing of pulp and paper requires a large amount of process water and energy in the form of steam and electric power. Consequently, the main environmental issues associated with pulp and paper production are discharges to water, emissions to air and energy consumption.

Most important processes/technologies related to energy efficiency

There are several different pulping and papermaking processes. Depending on the type of plant, a paper mill can be integrated with the pulping operations on the same site or can produce paper in stand-alone plants using purchased pulp. This BREF is divided into five main chapters describing the different processes, whereas energy aspects are discussed for each process separately. Evaporation and the maintenance of paper machines are the most important and most energy consuming processes.

The kraft (sulphate) pulping process
Within this pulping process the major part of the heat energy is consumed for heating different fluids and for evaporating water. Electrical energy is mostly consumed for the transportation of materials (pumping) and for the operation of the paper machine. The manufacturing of bleached kraft pulp consumes about 10–14 GJ/Adt of heat energy (steam for the production of electrical power not included). The consumption of electrical energy is 600–800 kWh/Adt, including the drying of pulp. The energy consumption for pulp drying is about 25 % of the heat energy and 15–20 % of the electrical energy. Over 50 % of the electrical energy consumption is used for pumping (BREF 4, 52–56).

The sulphite pulping process
A chapter for energy demand is reserved, but no data are available (BREF 4, 132).

The mechanical and chemi-mechanical pulping process
Energy consumption depends on the particular pulping process. For groundwood, for instance, the required energy varies between 1 100–2 300 kWh/t of pulp, while for refiner mechanical pulps the energy requirement amounts to 1 600–3 000 kWh/t of pulp. Finally, the thermo-mechanical pulps consume about 1 000–4 300 kWh/t of pulp (BREF 4, 182–185).

Recovered paper processing
Paper and board mills require substantial amounts of steam for heating water and large quantities of electricity for driving the machinery, and for pumping, vacuum, ventilation and waste water treatment. In paper mills, energy is usually the main factor in the operating costs. For example, in the Netherlands for recovered paper processing an average specific electricity consumption of 322 kWh/t (neglecting the difference in specific electricity consumption between RCF processing with and without de-inking) have been reported (BREF 4, 241–245).

Papermaking and related processes
The paper industry could be generally described as energy intensive. Energy is the third highest cost in the papermaking process, accounting for approximately 8 % of turnover. The total demand for energy (consumption) in the form of heat (steam) and electric power for a non-integrated fine paper mill has been reported as:

- Process heat: 8 GJ/t (about 2 222 kWh/t)
- Electric power: 674 kWh/t

More detailed information about the energy consumption of each single production step can be found in the BREF 4, pp. 336–342.

Energy recovery or energy saving techniques for the main processes

The energy recovery and energy saving techniques for the main processes are discussed below and can be considered as BAT.

Energy data and energy saving techniques for other processes

Most of the techniques to save energy are described below and can be considered as BAT. There is some information on the following processes:

Sulphite pulping
During the recovery process of chemicals, substantial amounts of energy can be produced (in recovery boilers) for steam and for power generation of the pulp mill.

Mechanical and chemi-mechanical pulping
Depending on the particular pulping process, it is possible to recover 20–30 % of energy either as steam or as hot water. For thermo-mechanical pulps the recoverable energy as steam can even reach 40–45 %. (BREF 4, 183).

Best available techniques (BAT)

Principally there are two different types of techniques, those which have to be considered in the determination of BAT (techniques not yet considered BAT) and others which are already considered as BAT, resulting from the BAT conclusions. Further, the BATs are subdivided into general BAT concerning general aspects and measures and into process specific BAT regarding specific information.

General BAT

The following measures can be considered as general techniques (primary measures) for all processes (BREF 4, 100):

- Training, education and motivation of staff and operators
- Process control optimisation
- Sufficient maintenance of the technical units
- Environmental management system which optimises management, increases awareness and includes goals and measures, process and job instructions, among other things.

Process specific BAT for the kraft pulp and sulphite pulp mills

Measures for high heat recovery and low heat consumption (BREF 4, 110–111):

- High dry solids content of black liquor and bark
- High efficiency of steam boiler, e.g. low flue gas temperature
- Effective secondary heating system, e.g. hot water about 85ºC
- Well closed-up water system
- Relatively well closed-up bleaching plant
- High pulp concentration (MC technique)
- Pre-drying of lime
- Use of secondary heat to heat buildings
- Good process control.

Measures for low consumption of electric power:

- As high pulp consistency as possible in screening and cleaning
- Speed control of various large motors
- Efficient vacuum pumps
- Proper sizing of pipes, pumps and fans.

Measures for a high generation of electric power:

- High boiler pressure
- Outlet steam pressure in the back-pressure turbine as low technical as is feasible
- Condensing turbine for power production from excess steam
- High turbine efficiency
- Preheating of air and fuel charged to boilers.

Process specific BAT for the mechanical and chemi-mechanical pulp and paper mills

- Implementation of a system for monitoring energy use and performance
- Upgrading of equipment
- Minimisation of reject losses by using efficient reject handling stages and reject refining
- Use of effective heat recovery systems
- Application of co-generation of heat and power where the power to steam ratio allows it.

Process specific BAT for recovered paper processing paper mills

- Implementation of a system for monitoring energy use and performance
- Upgrading of equipment.
- Application for anaerobic wastewater treatment.

Process specific BAT for paper mills

- Implementation of a system for monitoring energy use and performance
- More effective dewatering of the paper web in the press section of the paper machine by using wide nip pressing technologies
- Use of energy efficient technologies, such as high consistency slushing, best practice refining, twin wire forming, optimised vacuum systems, speed adjustable drives for fans and pumps, high efficiency electric motors, well sizing of electric motors, steam condensate recovery, increasing size press solids or exhaust air heat recovery systems
- Reduction of direct use of steam by careful process integration by using pinch analysis.

BAT associated values

Energy efficient kraft pulp and paper mills consume heat and power as follows (BREF 4, 110–111):

- Non-integrated bleached kraft pulp mills: 10–14 GJ/Adt process heat and 0.6–0.8 MWh/Adt of power;
- Integrated bleached kraft pulp and paper mills: 14–20 GJ/Adt process heat and 1.2–1.5 MWh/Adt of power;
- Integrated unbleached kraft pulp and paper mills: 14–17.5 GJ/Adt process heat and 1–1.3 MWh/Adt power.

Energy consumption associated with BAT for sulphite pulp and paper mills consume heat and power as follows:

- Non-integrated bleached sulphite pulp mills: 16–18 GJ/Adt process heat and 0.7–0.8 MWh/Adt of power;
- Integrated bleached sulphite pulp and coated fine paper mills: 17–23 GJ/Adt process heat and 1.5–1.75 MWh/Adt of power;
- Integrated bleached sulphite pulp and uncoated paper mills: 18–24 GJ/Adt process heat and 1.2–1.5 MWh/Adt power.

Energy efficient mechanical pulp and paper mills consume heat and power as follows (BREF 4, 214–215):

- Non-integrated CTMP: 2–3 MWh/Adt of power;
- Integrated newsprint mills: 0–3 GJ/Adt process heat and 2–3 MWh/Adt of electricity;
- Integrated LWC paper mills: 3–12 GJ/Adt process heat and 1.7–2.6 MWh/Adt power;
- Integrated SC paper mills: 1–6 GJ/Adt process heat and 1.9–2.6 MWh/Adt.

Energy efficient recovered paper mills consume heat and power as follows (BREF 4, 302–303):

- Integrated non-deinked RCF paper mills: 6–6.5 GJ/Adt process heat and MWh/Adt of power;
- Integrated tissue mills with DIP plants: 7–12 GJ/Adt process heat and 1.2–1.4 MWh/Adt of power;
- Integrated newsprint or printing and writing paper mills with DIP plants: 4–6.5 GJ/Adt process heat and 1–1.5 MWh/Adt power.

Energy efficient non-integrated paper mills consume heat and power as follows (BREF 4, 411–412):

- Non-integrated uncoated fine paper mills: 7–7.5 GJ/Adt process heat and 0.6–0.7 MWh/Adt of power;
- Non-integrated coated fine paper mills: 7–8 GJ/Adt process heat and 0.7–0.9 MWh/Adt of power;
- Non-integrated tissue mills based on virgin fibre: 5.5–7.5 GJ/Adt process heat and 0.6–1.1 MWh/Adt power.

Specific aspects for energy saving and energy recovery measures

Some energy recovery and energy saving techniques are site specific. This means that it depends on the location of the mill whether certain techniques can be applied or not.

Recommendation for the future

Little information is available on the assessment of energy efficient technologies and practical experiences of the results of implementation in the pulp and paper industry. When energy data and balances are reported the assumptions and conditions are often not sufficiently qualified. More work on this important issue and the derivation of production specific energy consumption figures are needed before the next review.

5.9 Chlor-alkali manufacturing industry

Importance of energy efficiency

The chlor-alkali process needs huge amounts of electricity. It is one of the largest consumers of electrical energy.

Most important processes/technologies related to energy efficiency

In the European Union the chlor-alkali process was mainly used in mercury (amalgam) cell technology. Past mercury contamination of land and waterways from mercury plants is a major environmental problem at some sites. For many years, the mercury cell has been a significant source of

environmental pollution, because some mercury is lost from the process to air and water, and shows up in products and waste.

Amalgam technology needs 3 560 ACkWh/t Cl_2 (alternative current kilowatt hours/tonne of chlorine) assuming 50 % of caustic soda and before liquefaction of chlorine. The operation of a chlor-alkali plant is dependent on the availability of huge quantities of direct-current (DC) electric power, which is usually obtained from a high voltage source of alternating current (AC) (BREF 5, 36–37).

Energy recovery or energy saving techniques for the main processes/technologies

There is little information about energy recovery or energy saving techniques within mercury cell technology. More information is given in the section on BAT.

Energy data and energy saving techniques for other processes

In the chlor-alkali industry there are two other technologies that are lower in importance in the sense of frequency compared to mercury cell technology, but that are more interesting as concerns energy savings: asbestos diaphragm cell and membrane cell technology.

The total adjusted energy consumption of diaphragm technology is almost the same as that of mercury: 3 580 ACkWh/t Cl_2. For membrane cell technology, the energy consumption amounts to 2 970 ACkWh/t Cl_2 (BREF 5, 36–37).

Best available techniques (BAT)

Principally there are two different types of techniques, those which have to be considered in the determination of BAT (techniques not yet considered BAT) and others which are already considered as BAT. A best available technique for the production of chlor-alkali is membrane technology. Non-asbestos diaphragm technology is also a BAT. The total energy use associated with BAT for producing chlorine gas and 50 % caustic soda is less than 3 000 ACkWh/t of chlorine when chlorine liquefaction is excluded, and less than 3 200 ACkWh/t of chlorine when liquefaction is included.

For mercury cell plants the best available technique is conversion to membrane cell technology. For diaphragm cell plants the best available technique is conversion to membrane cell technology or use of non-asbestos diaphragms.

Specific aspects for energy saving and energy recovery measures

There are hardly any energy recovery or energy saving techniques described, because there are not many ways to save energy in mercury cell and diaphragm cell technology. The BAT is the conversion to membrane cell plants.

The chlor-alkali production technology is site specific, because of the difficulties in storage and transport of chlorine. Therefore, production usually takes place near the consumers. More than 85 % of the chlorine produced in the European Union is used on the same or on adjacent sites for other chemical processes.

The chlor-alkali BREF also contains information about national and international legislation within the European Union. The emphasis is on air emissions and discharges to water, while energy saving aspects are mentioned incidentally (BREF 5, Annex D, 136–137).

5.10 Ferrous metals

Importance of energy efficiency

The ferrous metal BREF is divided into three main parts (hot and cold forming, continuous hot dip coating lines, batch galvanising) which describe the different specific processes, and in one part techniques which might be applied to several subsectors are described. Energy consumption is a main environmental issue in the first two parts of the BREF together with air emissions (especially NO_x, SO_2) and dust emissions. In the third part energy use does not play an important role, which is probably why there is almost no information. The fourth part contains detailed technical descriptions and information on techniques which might be applied to several subsectors. Most of this information is concerned with the reduction of emissions, while energy aspects are inadequately discussed.

Most important processes/technologies related to energy efficiency

Part A: hot and cold forming
There are several techniques and processes within hot and cold forming technology, but the most important concerning energy efficiency is the heating (reheating) and heat treatment process in furnaces. The energy consumption of the furnaces depends on several parameters such as the furnace design, throughput and shift patterns, the designed length of the recuperation zone in the furnace, the burner design, among others. The energy consumption for these furnaces was between 0.7 GJ/t to 6.5 GJ/t; with a typical range being 1–3 GJ/t (BREF 6, 63–65).

Part B: continuous hot dip coating lines
As in Part A, the most important process is reheating and heat treatment in furnaces.

Part C: batch galvanising
No special process is mentioned

Energy recovery or energy saving techniques for the main processes

Almost every energy saving technique regarding re-heating and heat treatment furnaces is considered as BAT (see section “Process specific BAT”).

Energy data and energy saving techniques for other processes

More processes and techniques concerning energy consumption in part A are:

- hot rolling 72–140 kWh/t (deformation energy)
- pickling of alloy 0.015–0.3 GJ/t (electrical energy)
- cold rolling 0.2–0.3 GJ/t (electrical energy)
- annealing of alloy 0.06–0.12 GJ/t (electrical energy)
- tempering 0.02–0.15 GJ/t (electrical energy)
- finishing (cutting, inspection, packing) 0.02–0.04 GJ/t (electrical energy)
- and many more where energy data are not available.

There is limited information on energy saving techniques (BREF 6, 81–87).

In part B several other processes are mentioned; however there is only limited information on energy (consumption) (BREF 6, 276, 281–282):

- consumption for total coating line — 800–1 300 MJ/t (natural gas); 44–140 MJ/t (electrical); 20–44 MJ/t (hot water)
- aluminising of sheet — 67 kWh/t (electricity); 273 kWh/t (gas)
- lead-tin coating of sheet — 2.43 kWh/t (electricity); 1 490 MJ/t (gas)

Energy consumption data for part C (BREF 6, 345–346, 350):

- degreasing — 0–44.6 kWh/t
- pickling — 0–25 kWh/t
- hot dipping — 180–1 000 kWh/t
- and many more where energy data are not available

Additionally, for the hot dipping process there is a short description of possible savings (BREF 6, 377–378, 384).

- Enclosed galvanising pot → energy savings due to reduced surface heat loss from the galvanising bath.
- Heat recovery from galvanising kettle heating → reduced fuel consumption. Energy reductions in the range of 15–45 kWh/t black steel.

Best available techniques (BAT)

Principally there are two different types of techniques, those which have to be considered in the determination of BAT (techniques not yet considered BAT) and others which are already considered as BAT. For the ferrous metals processing industry these techniques are almost the same. Further, it is possible to divide the BAT into general techniques (primary measures) and more process specific ones.

General BAT

The following measures can be considered as general techniques (primary measures) for the hot and cold forming part:

- general measures, e.g. regarding furnace design or operation and maintenance.

Process specific BAT

For part A, hot and cold forming: re-heating and heat treatment furnaces

- Recovery of heat in the waste gas by feedstock pre-heating
- Recovery of heat in the waste gas by regenerative or recuperative burner systems
- Recovery of heat in the waste gas by waste heat boiler or evaporative skid cooling (where there is a need for steam) → energy savings 25–50 %
- Limiting the air pre-heating temperature.

Descaling

- Material tracking to reduce water and energy consumption.

For the others there are no BATs regarding energy aspects. Most of the energy related saving techniques are mentioned above.

Specific aspects for energy saving and energy recovery measures

For some techniques (also BATs) energy savings have to be traded off against NO_x emissions. Reductions in SO_2, CO_2 and CO have to be weighted against the disadvantage of potentially increased emissions of NO_x.

Recommendation for the future

For the revision of this BREF, information on emissions, consumption levels and economics should be provided. Especially for quite a number of the techniques to be considered in the determination of BAT, there is a lack of information on these aspects at the moment. Of particular interest are figures on NO_x emissions both for furnaces that use air preheating and those that do not. Such data would make it possible to do both a more thorough evaluation of the efficiency of reduction measures and a comparison of the advantages and disadvantages of energy savings versus NO_x emissions.

5.11 Glass manufacturing industry

Importance of energy efficiency

Glassmaking is a very energy intensive activity and the choice of energy source, heating technique and heat recovery methods are central to the design of the furnace. The key environmental issues are emissions to the air and energy consumption.

Most important processes/technologies related to energy efficiency

The melting operation is the central process in the glass manufacturing industry. Its environmental performance and energy efficiency is also affected by the choice of energy source, heating technique and heat-recovery methods. The three main energy sources for glassmaking are natural gas, fuel oil and electricity.

In general, the energy necessary for melting glass accounts for over 75 % of the total energy requirement of glass manufacturing. The theoretical energy requirements for the three most common glasses (soda-lime, borosilicate and crystal glass) for the melting process vary from 2.25 GJ/t to 2.68 GJ/t. The actual energy requirements in the various sectors vary widely from about 3.5 GJ/t to over 40 GJ/t. The amount of energy needed depends very heavily on the furnace design, scale and method of operation. However, most glass is produced in large furnaces and the energy requirement for melting is generally below 8 GJ/t (BREF 6, 72–75). For 1997 the energy consumption of the glass industry was approximately 265 GJ/t.

Energy recovery or energy saving techniques for the main processes

The main melting techniques are listed below:

- regenerative furnaces
- recuperative furnaces
- oxy-fuel firing
- electric furnaces
- combined fossil fuel and electric melting
- discontinuous batch melters.

For the regenerative furnaces a heat recovery system is used, while for the oxy-fuel firing melting technique, energy savings are possible because it is not necessary to heat the atmospheric nitrogen to the temperature of the flames.

Energy data and energy saving techniques for other processes

Generally, the glass industry can be subdivided into eight sectors based on the products manufactured. These products consist of container glass, flat glass, continuous filament glass fibre, domestic glass, special glass, mineral wool, ceramic fibre and frits. For each of these subsectors the melting process is dominant. However, there are a few other processes that should be mentioned.

- the forming process (2–5 %)
- annealing (about 3 %)
- forehearths (about 6 %)
- conversion (about 11 %)
- factory heating
- general services

The values show the range of the total energy consumption.

Best available techniques (BAT)

For the glass manufacturing industry, only techniques used in the determination of BAT are mentioned. These techniques for reducing energy use are:

- Melting technique and furnace design (about 15 %)
- Combustion control and fuel choice n.a.
- Cullet usage (2.5–3 %)
- Waste heat boilers n.a.
- Cullet/batch preheating (10–20 %)

The values show the range of energy savings.

Specific aspects for energy saving and energy recovery measures

There were no specific aspects concerning energy saving or energy recovery measures mentioned.

Recommendation for the future

When the work is reviewed a more in-depth assessment of techniques to improve energy efficiency would be useful, taking into account more recently available information.

5.12 Industrial cooling systems

Importance of energy efficiency

Cooling is an essential part of many industrial processes and should be seen as an important element in the overall energy management system. The intention is to reuse superfluous heat of one process in other parts of the process or in different processes on site in order to minimise the need for discharge of waste heat into the environment.

Most important processes/technologies related to energy efficiency

In this industrial sector it is easier to speak about cooling systems instead of processes. Usually it is a process that has to be cooled. There are eight cooling systems mentioned, whereas each system is principally characterised by the cooling medium, the main cooling principle, minimum approaches, the minimum achievable end temperature of the process medium, and the capacity of the industrial process. The environmental aspects are different for each of the industrial cooling systems. As far as energy consumption is concerned, the most important cooling system is closed circuit dry cooling. Most of the high energy consumption is used for driving the fans.

The energy requirement of industrial cooling systems can be considered as direct or an indirect consumption. Direct consumption is the use of energy to operate the cooling system. The major energy users are pumps and fans. The energy consumption of the production process is referred to as the indirect energy consumption caused by the cooling process.

The total (direct and indirect) energy consumption for a closed circuit cooling tower amounts to more than 34 kW_e/MW_{th} (BREF 8, 67–70).

Energy recovery or energy saving techniques for the main processes

The energy saving and energy recovery techniques mentioned here do not refer just to the most important cooling system (closed circuit dry cooling), but rather give an overview of all applied cooling systems (BREF 8, executive summary, V). Basically it is possible to reduce the direct or indirect energy consumption. For the indirect energy reduction the following measures are available:

- select the cooling configuration with the lowest specific indirect energy consumption (in general once through systems);
- apply a design with small approaches; and
- reduce the resistance to heat exchange by proper maintenance of the cooling system.

The following measures are applicable to the reduction of direct energy consumption:

- Use pumps and fans with higher efficiencies.
- Reduce resistance and pressure drops in the process by design of the cooling system and by application of low resistance drift eliminators and tower fill.
- Proper mechanical or chemical cleaning of surfaces to maintain low resistance in the process during operation.

Energy data and energy saving techniques for other processes

All measures to reduce energy consumption have been discussed above for all cooling systems, together.

Best available techniques (BAT)

Principally, the BATs are subdivided into general and process specific BATs.

General BAT

The following are BATs in the design phase of a cooling system:

- To reduce resistance to water and airflow

- To apply high efficiency and low energy equipment
- To reduce the amount of energy demanding equipment
- To apply optimised cooling water treatment in once through systems and wet cooling towers to keep surfaces clean and avoid scaling, fouling and corrosion.

Process specific BAT

The selection of wet or dry cooling or wet and dry cooling to meet process and site requirements should be aimed at the highest overall energy efficiency. To achieve a high overall energy efficiency when handling large amounts of low level heat (10–25ºC), it is BAT to use open once-through systems for cooling. In a greenfield situation this may justify selection of a (coastal) site with reliable large amounts of cooling water available and with surface water with sufficient capacity to receive large amounts of discharged cooling water.

When cooling hazardous substances that pose a high risk to the environment, it is BAT to apply indirect cooling systems using a secondary cooling circuit (BREF 8, 125–126).

Specific aspects for energy saving and energy recovery measures

It is acknowledged that the final BAT solution will be a site-specific solution.

5.13 Summary of energy issues in the BREFs

All the analysed BREFs contain a considerable amount of information and data on energy. The most specific information is available for energy consumption within more or less all the sectors. As far as energy saving and energy recovery techniques are concerned, there is less information. In general, there is a need for more information regarding all the energy aspects (consumption, savings and recovery measures and values).

BATs are generally subdivided into general and process specific BATs. In a few cases, each process specific BAT within a industrial sector is shown in a table and described separately.

The purpose of the BAT chapter is thus to provide general indications regarding the emissions and consumption levels that might be considered as an appropriate reference point to assist in the determination of BAT-based permit conditions or for the establishment of general binding rules. In other words, environmental permit conditions should be based on BATs, and BREFs (which are not binding) should be taken into consideration as one important source of information on BAT.

A description of energy aspects found in each BREF follows (summary table in Section 5.14).

5.14 Summary of energy efficiency (EE) aspects in the BREFs

	Cement and lime March 2000	Iron and steel March 2000	Non-ferrous metals May 2000	Pulp and paper July 2000	Chlor-alkali October 2000	Ferrous metals October 2000	Glass October 2000	Cooling systems November 2000
Importance of EE compared to other environmental issues	highly intensive (emission air)	highly intensive (air emissions)	important (air emissions)	high (water discharges)	important (air / water emissions)	important (air emissions)	very intensive (air emissions)	high
Which is the most important and energy intensive process/technology?	clinker burning, lime burning	blast furnace	pyrometallurgical processes	depends on the plant evaporation/paper machine	mercury (amalgam)-technology	heating and heat treatment furnace	melting	closed circuit dry cooling dry air cooling
Is energy data available?	yes, only for consumption	yes (good description)		yes, data available	yes, only for consumption	yes (good description)	yes (good description)	yes, only for consumption
Are energy recovery/savings techniques for this process mentioned?	not in detail, partly also considered as BAT	yes, a lot partly also considered as BAT	yes, consumption and recovery	yes, techniques in general considered as BAT	yes, in terms of process selection	yes, a lot partly already considered as BAT	yes, a lot	yes, but rarely
Is energy data for other processes (including techniques) available?	yes, in general for consumption	yes	yes, consumption + recovery	yes, consumption data available	yes, consumption data	yes (good)	yes, mainly for consumption	yes, consumption
BAT General BAT available	yes (primary measures)	yes	yes	yes	yes (primary measures)	yes	yes (design phase)	yes (design phase)
BAT for specific processes	yes, limited	yes, BATs for all types of plants	yes	yes	yes, limited	yes, good description	Not mentioned as BAT (to consider in the determination of BAT)	yes
Energy data in BAT	yes, only consumption (limited)	yes, table for each BAT	yes	yes, almost in every BAT	yes, limited	yes, data about consumption, saving recovery	Not concerning EE, only emission levels	yes, partly
Are energy recovery/savings measures site specific?	no	not mentioned	yes	yes, a few (CHP)	yes, because of difficulties in storage + transport	not mentioned	not mentioned	yes, but difficult to quantify
Are any recommendations for the next update mentioned?	survey of current techniques consumption is useful	n.a.	more information about consumption data	more information on the assessment of energy efficient techniques	n.a.	provide more information on emission and consumption level	more techniques for EE improvement would be useful	n.a.
Special comments	energy costs = 30–50 % of total production costs associated BAT heat balances value is 3 000 MJ/t clinker	there are many different kind of plants; each has different processes + techniques	limited information about EE in BATs. General ok!	a lot of information concerning EE for each single process. A lot of energy recovery techniques are not considered as BATs yet.	information about process conversion (technologies) and about legislation for some EU countries. associated with BAT: < 3 200 kWh per t of chlorine large consumption of electrical energy	balance between EE and air pollution (for certain techniques) very detailed description of BATs	BATs are concentrated more on emissions melting process needs about 75 % of all energy usage	BATs are described but only a few have a lot of data → the final BAT solution will be a site-specific sol. calculation model for energy conservation + saving is given

6 VOLUNTARY ENVIRONMENTAL MANAGEMENT SYSTEMS

6.1 General background

Environmental Management Systems (EMSs) are used as a tool of business management among industrial enterprises all over the world. There are mainly two systems in use: the international/European standard EN/ISO 14001:1996 and the Eco-Management and Audit Scheme (EMAS) of the European Union. Both systems are based on continuous improvement of environmental performance, including energy use. There are presently about 3 800 organisations and sites registered for EMAS in the EU and probably four times more organisations certified to ISO although the number of ISO certifications can only be estimated since many countries do not have a central ISO register.

EMAS was adopted by the EU Council in June 1993 and was revised in 2001. It has been open for participation by companies since April 1995. The overall objective of the scheme is to promote continuous environmental performance improvements of industrial activities by committing sites to evaluate and improve their environmental performance and provide relevant information to the public. The revised EMAS Regulation was adopted by the European Parliament and the Council in March 2001 and entered into force in April 2001. It now includes EN/ISO 14001:1996 as the core environmental management system. The new EMAS Regulation requires Member States to promote organisations' participation and asks Member States to identify options to avoid unnecessary duplication of effort for registered organisations in relation to implementation of environmental legislation.

ISO (International Organization for Standardization) published the environmental management standard ISO 14001 in 1996, which is based on and which replaced many national EMS standards. This standard has been adopted world wide and can be used by all kinds of organisations.

The main difference between the EMAS scheme and the ISO standard is that the latter does not require the publication of an environmental statement, and that the verification and registration system is under the control of the Member States. EMAS guarantees also legal compliance with environmental legislation in contrast to ISO. Another difference is that a whole company can be ISO 14001 certified even if the places of business are located in different countries (Palosaari 2001). EMAS remains a site-specific scheme, which means that all sites of a registered entity will be subject to verification unless they are very similar and have relatively small environmental impacts.

As instruments of environmental policy the roles of EMAS and the ISO standard are different. EMAS is a part of the official environmental policy of the European Union and the Member States have the responsibility to promote EMAS. For ISO 14001 it is the International Organization for Standardization and its national members which are responsible of the development of the standard. Private companies have a central role in this process and environmental authorities are only one stakeholder among many (Honkasalo 1998).

6.2 ISO 14001

The role of the ISO 14001 environmental management system in the permit procedure is mainly to provide background material. Only Poland and Sweden pointed out that it has no role in the procedure. According to the replies to the questionnaire, the ISO system is not an actual part of the permit

procedure. Sweden's view on this subject is that it could be used by the applicant in arguing that no specific requirements should be set. (Annex I, Table 52)

In Germany the applicants are allowed to use documents, which have been used in the ISO process, as application documents, if they are specific enough. This is very rarely the case because the ISO 14001 standard is applied to the company as whole in regard to the existing site(s) and not to planned single installations. In Ireland, the permits require the company to have an Environmental Management Programme in place. The ISO 14001 system is accepted by the Irish Environmental Protection Agency (EPA) as an Environmental Management Programme in the permit procedure. (Annex I, Table 52)

In general, management schemes do not play a dominant role in permit procedures in the Netherlands unless an applicant wants a permit where it will take over parts of the, mostly certified, scheme. The Portuguese applicants can deliver a complementary report together with the application form, including relevant information to the evaluation. A description of any environmental management system can be included in the report. (Annex I, Table 52)

Finland, Italy and Portugal are the only countries which have some legislative possibilities on the use of the ISO 14001 system in the permit procedure. In Austria the only legislative provisions refer to the supervision procedure. ISO documents must be recognised as documents for the self-evaluation of the installation. The Finnish Environmental Protection Decree says that "where necessary, the permit decision must also indicate how environmental management systems or measures and reporting based on energy saving agreements have been taken into account in setting the terms of the permit". (Annex I, Table 53)

Certification under ISO 14001 has, in general, no specified role in the permit procedure concerning energy efficiency. In the United Kingdom it may satisfy some of the energy management requirements and in Ireland the EPA may use the certification as a useful tool when carrying out its own environmental audits in a company. An example of this might be to look at the findings of an ISO audit and check whether or not non-compliance and observations were closed off. Certification under ISO 14001 and the use of the ISO standard overall are a part of the integrated approach in the permit procedure (Italy and Lithuania). Portugal's point of view is that certification does not guarantee that an installation will use energy efficiently, it merely indicates the company's commitment and effort in doing so. (Annex I, Table 54)

The general opinion about the influence of the ISO 14001 standard on the supervision of energy efficiency is that it has at least some positive effect on the supervising procedure. The standard requires that staff are properly trained and that issues such as calibration maintenance and document controls are closely managed. Energy efficiency might well be a key performance indicator in a company's ISO 14001 Environmental Policy Statement. For these reasons, Ireland will use the ISO 14001 standard to compliment the permitting of energy efficiency. In the United Kingdom it will possibly have some influence, although not to a great extent. Finland says the influence of the standard will only be on a voluntary basis because the implementation is supervised by certifiers. In Sweden the standard will perhaps be taken into account to some degree. (Annex I, Table 55)

The specific advantage of co-ordinating the ISO 14001 standard and the permit procedure as concerns energy efficiency is the simplification of the procedure through reduced work load on both the applicant and the authority. Additional advantages are the compatibility of the two procedures and the possibility for the authorities to ask the certifiers to pay more attention to the energy efficiency issue. Co-ordination of the two would provide tight control over an activity as it would have to meet

the requirements of the ISO standard as well as the permit requirements. Both sets of requirements may well be similar; however, there will be two different bodies available to assess the companies' objectives, targets and results (Ireland). (Annex I, Table 56)

The major problem concerning co-ordination is that the ISO 14001 standard is a voluntary system not regulated by law and, therefore, the legal status of it is doubtful. According to the replies of Portugal and the United Kingdom, the certification authorities do not certify performance, which is the essential objective of the permit. Nor does certification under ISO 14001 say whether the energy targets are realistic in the context of the IPPC directive. Sweden's opinion is that there are no specific problems concerning co-operation, but the lack of openness under the ISO standard can cause problems. (Annex I, Table 57)

6.3 EMAS

The role of EMAS in the permit procedure is quite similar to the situation with the ISO standard – it is used mainly as background information. Poland and Sweden pointed out that so far it has no role in the procedure. In Italy, EMAS is a part of the procedure since EMAS-registered sites benefit of an extension of the permit's validity from five to eight years. In Germany the applicants are allowed to use documents from the EMAS system as application documents if they are specific enough. The Irish permits require the applicant to have an Environmental Management Programme in place and EMAS is accepted for that purpose. EMAS can also be used in Lithuania as background material. However, there do not yet exist any EMAS-registered companies in Lithuania so far. (Annex I, Table 58)

Five countries have legislative possibilities to use EMAS in the permit procedure. The Finnish decree was already mentioned in Section 6.2. The German government adopted a decree on the possibility to simplify documents for application. In Portugal, applicants can include a description of their EMS in the application. Ireland has no legal possibilities for the use of EMAS in the permit procedure but points out that in such a case there would be two different bodies assessing the companies' objectives, targets and results. (Annex I, Table 59)

Austria has its own approach. The new Environmental Management Act from 2001 provides certain benefits for EMAS organisations. Certain changes to an installation do not need a permit procedure any more provided that the authorities are notified of the change. One condition for this simplified procedure is a binding statement of an environmental verifier that the changes take into account state-of-the-art technologies or BAT, among other things. EMAS-registered organisations may also obtain a consolidated permit, which includes all permits for an installation. The act also simplifies control and notification obligations. Companies that have registered for EMAS or ISO 14001 may be subject to self-monitoring of processes. (Annex I, Table 59)

The general opinion concerning the role of the verification of EMAS and the environmental reports is that these could serve as useful background information for the authorities, but the role is not very relevant at the moment. EMAS can also be useful for an applicant when preparing the application. (Annex I, Table 60)

In relation to the supervision of energy efficiency measures, EMAS is seen in most countries as a complimentary measure and facilitates better energy management. It can also be an instrument to support supervision by the authorities (Germany). Denmark's opinion is that the advantages will be

mainly on the companies' side. Other advantages for co-ordinating EMAS and the permit procedure are quite similar to the ISO 14001 standard:

- EMAS provides better control of an installation as it would have to meet both EMAS requirements as well as the permit requirements;
- EMAS allows simplification of the permitting procedure and can avoid extra work both for the companies and the authorities. (Annex I, Tables 61–62)

Only four countries have the opinion that there are some specific problems concerning the co-ordination of EMAS and the permit procedure. These are quite the same as for the ISO standard (Annex I, Table 63):

- the legal status can be doubtful if a permit simply refers to information from an environmental management scheme (the Netherlands);
- the environmental management targets can be unrealistic in the context of the IPPC directive (the United Kingdom);
- if a licensee has to publish an environmental report under EMAS, there might be problems with confidential information (Ireland); and
- each authority has to decide case by case how intense its own supervision can be taking into account potential problems and human resources (Germany).

The working group on the seminar considered that the EMS targets should not be transferred as such to the permit. That could affect negatively the companies' interest in setting targets and even in applying environmental management systems. However, concrete measures already decided upon may be included in the permit. In relation to this question it was noted that no financial aid can be given for conditions mentioned in the permit.

There should be clear and attractive incentives for the companies to implement management systems. Examples brought up by the group include the prolongation of the permit periods from five years up to eight years (Italy), no need for a renewal of the permit in certain cases of substantial change in operations (Austria), and a lower level of supervision by authorities. Supervision of companies and installations without any EMS should be increased.

7 VOLUNTARY ENERGY SAVING AGREEMENTS

7.1 General questions

The concept of voluntary energy saving agreements is in use in eight of the countries participating in this project. It is currently not in use in Austria, Lithuania, Poland, Portugal and Sweden. The first agreements were concluded in the Netherlands in 1992, where the implementation of the energy agreements depends on the category of the installation. In most Dutch cases companies join an agreement and plan their own objectives. For major energy consumers a long-term agreement on energy efficiency (MJA) is in use and the reduction targets are agreed at the branch level. The agreements follow a particular national form in the participating Member States except in Italy, where there are no guidelines or rules to define a standard agreement. (Annex I, Table 64)

There are many different ways that companies take part in the agreements. In most countries the objectives of the agreement apply to the companies or industrial branches. In Germany they apply only to the branches and in Finland only to the companies. The Irish approach is that the objectives generally apply to a particular site location and in the Netherlands they will apply also to the operator. If Sweden were to have these voluntary agreements in use, all alternatives and combinations of them would be considered. (Annex I, Table 65)

Most countries do not know how many installations covered under the IPPC directive and other installations have joined a voluntary energy saving agreement. A few countries have some estimates though: Denmark (114 industrial companies), Finland (approximately 125 IPPC installations and 125 other installations) and France (100–200 IPPC installations and 550 other installations). In the United Kingdom 12 500 installations, including IPPC installations, are participating. The estimates of the total energy consumption of the IPPC installations vary between more than 33 % (Ireland) and 99 % (the Netherlands). The latter figure can be explained by the fact that almost all major installations have joined the benchmarking agreement or the MJA scheme. Energy use estimates covered by all participating installations have been given by three countries varying from 30 % (France), 60 % (Denmark) up to 70–80 % (Germany). (Annex I, Tables 66–67)

At the end 2001 the voluntary energy saving agreements in Finland covered about 85 % of all industry, 89 % of power production, 76 % of electricity transmission and distribution, 72 % of district heating, 55 % of municipalities, 73 % of real estate sector, 14 % of truck transportation and 35 % of bus traffic. The connection to the IPPC directive can be seen as a joint venture in seeking methods and tools for the determination of and follow-up to energy efficiency in various sectors.

7.2 Voluntary energy saving agreements

Generally, an agreement is made between an individual company and a governmental institution like a ministry or energy agency. This is the practice in Denmark, Finland, France, Ireland and the United Kingdom. The Finnish companies sign the agreement with the Ministry of Trade and Industry and the Confederation of Finnish Industry and Employers. In all of the countries mentioned above, except Finland, different branches or representative trade bodies can join a voluntary energy saving agreement on behalf of the members. This is the only way of joining the agreement in Germany, where it is based on a declaration between the government and several industrial or trade organisations. There is also a supplementary voluntary agreement between the German government and the industrial associations which represent energy suppliers. Italians can include several parties in the agreement, and in the Netherlands companies implementing the benchmarking or long term

agreement on energy efficiency (MJA) work with their own branch organisation and the National Agency for Energy and the Environment (Novem). (Annex I, Table 68)

The main obligation of the parties involved in the voluntary energy saving agreements is, as a matter of course, to reduce (specific) energy consumption with binding reduction targets. Other important aims are to make energy efficiency an integral part of the companies' operation (Finland and Ireland), to organise monitoring and data reporting (France and Germany) and to compare and share the knowledge of outstanding energy efficiency issues (France, Germany, Ireland and the Netherlands). The main target in Germany is to reduce CO_2 emissions or specific energy consumption by a declared sector-wise range from 16 % to 66 % based on the 1987/90 aggregating to a 20 % reduction in 2005. The "Climate Change Agreements" in the United Kingdom provide several industrial sectors with an 80 % discount from energy tax on coal, gas and electricity in return for a negotiated and binding energy consumption reduction target. Agreements describe the total reduction either in absolute or relative terms. Allowances can be made for changes in product output or mix or unforeseen regulatory and planning constraints. (Annex I, Table 69)

In seven countries the agreements include regular reporting, which is the most frequently mentioned alternative of the contents (see Figure 6). Only Italy does not specify the contents of their agreements because the contents vary depending on the agreement. Other common features of the agreements are energy inspection, monitoring of energy consumption in existing installations, plans for making energy saving more effective and energy saving measures. Only three countries mentioned that one part of their agreement is the determination of energy consumption in new installations. All of the eight alternatives mentioned in the questionnaire are in use in Ireland and the Netherlands, as is benchmarking, which is an example of a national "extra" measure. Sweden plans to include all of the alternatives in its the possible forthcoming agreement system. (Annex I, Table 70)

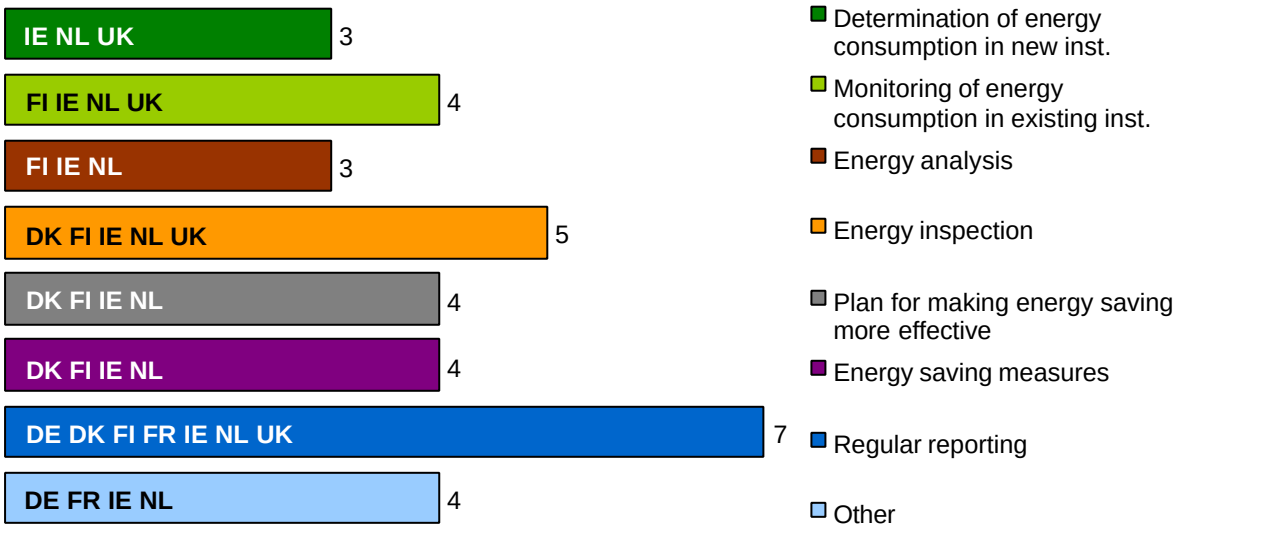

FIGURE 6 (Annex I, Table 70). Main contents of the energy saving agreements.

Energy audits are mostly done by the operator or a private organisation, such as a consultant. The former carries them out in Finland, Germany, Ireland and the Netherlands, while the latter is valid in Denmark, France and the United Kingdom. Many of the countries have two auditing bodies, for example in Finland the audit is done by consultancies certified by the Energy Information Centre for Energy Efficiency and Renewable Energy Sources (Motiva) in co-operation with the company. In France there are no energy audits, but the representative of the specified branch conducts a de-

tailed monitoring and an independent monitoring is conducted by the environmental authority at the branch level. (Annex I, Table 71)

Although the energy saving agreements are voluntary, it is important to ensure that their aims are fulfilled. Some criticisms were mentioned in the seminar about the lack of legal sanctions if the companies do not comply with the agreement. The only country which is using all three means mentioned in the questionnaire is the Netherlands. The most used means of verifying that the aims have been fulfilled is to report on the implemented energy saving measures. Two other means are to analyse the specific energy consumption or to develop an index for energy efficiency. This is the situation e.g. in Ireland, where an index is developed for the installation. The index might look like energy utilised per units produced. The resulting value is used to compare energy consumption from year to year. Germany pays attention also to a specific CO_2 emission reduction rate and examples of outstanding measures. The only means used in the United Kingdom are absolute or relative reductions achieved in measured energy use. The installations report mainly to non-environmental state organisations, only the French branches or professional unions collect the data and report to the environmental ministry. Private organisations are used in Germany and the Netherlands. (Annex I, Tables 72 and 73)

The voluntary energy saving agreements have to be attractive to the companies. In other words they are looking for some economic benefits or other added value for their business. The basic benefit, at least in the long run, is of course saving money as a result of decreasing energy consumption. Lower taxation is one of the most popular incentives judging from the replies to the answers. The German system is the only one with an incentive for avoiding legal sanctions, when the government relinquishes to propose a bill on the fixing of measures for energy efficiency or to cover energy consumption with higher taxation as long as the industry taken as a whole meets the voluntary agreement. As mentioned earlier, British companies will get an 80 % discount on tax on coal, gas and electricity use. Companies can also get grants for energy saving measures as in Denmark. Finnish parties joining the agreement can get 40–50 % aid for the energy analysis and up to 15–20 % for energy saving investments. Non-compliance with the agreement can be viewed as bad publicity in Ireland, where there are no special incentives. In France, too, the agreements and the results are made public, which is seen as a sufficient incentive. Avoidance of enforced permit conditions by individual authorities is the Dutch incentive for fulfilling the agreement. (Annex I, Table 74)

7.3 Voluntary energy saving agreements and the permit procedure

The role of the voluntary energy saving agreements in the permit procedure is quite embryonic at present. They are used as a part of the procedure only in the Netherlands and the United Kingdom. The Dutch saving or reduction measures developed as a part of the agreement are incorporated in the permit. Seven of the participating countries replied that they play a role as background material, of which Portugal and Sweden do not have the voluntary agreement system in use at the moment. Furthermore, it does not seem likely that the possible forthcoming agreements would play a role in the Swedish permit procedure. The information provided by the agreement will come up in the Annual Environment Reports, in Italy the agreement could be included in the permit case by case. (Annex I, Table 75)

According to the Finnish Environmental Protection Decree it shall be stated in the permit how the environment management systems or measures and reporting based on energy saving agreements have been taken into account in setting the terms for the permit. From the Ministry of Trade and Industry's point of view the voluntary actions come first and foremost followed by setting the permit

conditions. No other country has any supportive reference in their national legislation to use these agreements in the permit procedure. Specific guidance on this issue is available in the Netherlands, where the ministerial decision "Energie in de Milieuvergunning" is dealing with the relationship between agreement participation and permits. Statutory guidance is expected in the very near future from the British government, at present non-statutory guidance is provided by the regulators. Other participating countries have no guidance according to the replies. (Annex I, Tables 76 and 77)

It is seen unlikely that the environmental permit authorities will influence the aims of the agreement to any great extent. In the United Kingdom voluntary agreements may be revised upon application to the government if environmental regulations (IPPC) require action which results in increasing energy consumption. The Irish EPA can have an indirect effect by influencing the content of the Environmental Management Programme. This may in turn influence the agreement as there is a legal requirement between the installation and the EPA. The Swedish permit authority would not be barred from imposing stricter requirements than those set out in a potential agreement and as long as Dutch companies are in line with the agreement, authorities are not supposed to impose other measures than those developed as part of the agreement. (Annex I, Table 78)

Co-ordinating the voluntary energy saving agreements and the permit procedure is seen to have some advantages and also some difficulties. The Finnish point of view is that there could be advantages connected with avoiding the duplication of work when reporting monitoring data to different organisations, depending on whether it deals with the permit or agreement. It can also make the permit procedure less time-consuming (Sweden) and it would allow monitoring at the installation level in France. Portugal's opinion is that the operator will benefit by dealing with fewer different authorities and the authorities' benefit by using the information provided by the agreement as background material for an IPPC permit. Germany points out that the advantage is just the knowledge that there will be energy savings even if the permit authorities do not emphasise this issue.

Adopting the goals of the voluntary agreements in the permit procedure is seen as very important in Ireland. The Irish EPA use the following condition in new permits:

> "The audit shall identify all opportunities for energy use reduction and efficiency and the recommendations of the audit will be incorporated into the Schedule of Environmental Objectives and Targets under Condition 2.2 above.".

The Irish EPA and Irish Energy Centre have already begun to liaise closely on energy issues. The experience gained by the Irish Energy Centre in co-ordinating the voluntary agreement scheme will prove very helpful to the EPA. There have been some very interesting schemes developed for the control of energy in the voluntary agreements and it is likely that many of these methodologies will be used in the permit procedure (that is evaluation of energy reports submitted to the EPA). At the moment the agreements are not in use in the procedure. (Annex I, Table 79)

Four countries see some problems in using the voluntary energy saving agreements in the permit procedure. The scale and objectives can be too different if the agreements refer to industrial branches and the permits to single installations (Germany and France). In the Netherlands some authorities complain about a lack of information concerning the choices made as part of the agreements, in other words they are confronted with the outcome but have no information on how the choices have been selected and the alternatives considered. Sweden would prefer legally binding and enforceable agreements because they are desirable for all parties involved. However, there must be incentives for stakeholders to conclude agreements and these incentives will be severely weakened if the permit authority can affect issues which are regulated in the agreement, that is, impose stricter requirements (Sweden and Portugal). (Annex I, Table 80)

8 REPORTING AND SUPERVISION

8.1 Reporting of energy use and efficiency in IPPC installations

In most of the countries participating in this project there is an obligatory monitoring and reporting system of energy use (Denmark, Finland, France, Ireland, Lithuania, the Netherlands, Sweden, and the United Kingdom) (Annex I, Table 81). Austria and Germany do not have such a system. In Poland the reporting system is under preparation and it is too early to know what form it will take. However, reporting systems of energy efficiency are not obligatory in many countries (Austria, Denmark, Finland, France, Germany and Lithuania). See also Austria, Section 7.2. In some of the countries reporting on energy use is not clearly required. For example, in Sweden the report must include information on resources used. (Annex I, Table 81).

The practice varies as to which authority the report must be given (Annex I, Tables 82 and 83). In Denmark, France and Portugal the energy authority collects and treats the data, whereas in Italy, Sweden and the United Kingdom reports are sent to the environment authority. In Finland the energy authority collects reports according to voluntary energy saving agreements and the environment authority collects reports according to the environmental permitting system. The reporting frequency is every year in Finland, Lithuania and Sweden. In Portugal, energy intensive consumers have to do an energy consumption and management plan for five years. The monitoring is carried out mostly annually in the participating countries or it varies on a case by case basis.

Fuel consumption, energy production (electricity or heat) and energy consumption (electricity or heat) are the monitored parameters in all countries that have a monitoring system (Annex I, Table 84). Additionally, the energy index and specific energy use may be monitored according to the monitoring system in Ireland and in the Netherlands because each company is examined individually and the parameters depend on the agreement or permit. (Annex I, Table 84).

How the supervisory and permitting authority get the information about energy efficiency development varies extensively in the countries (Annex I, Table 85). Some of the countries are using sector-wise information and others are using installation-specific data. For example, in Denmark the competent authority uses sector analyses. In Finland some information is included in the companies' environmental reports. Any available information can be included in the permit application. In France the environment authority and energy authority share local representatives. Hence, information is shared but no institutional information sharing is organised. In Germany the operators are obliged to inform the authority of changes in energy efficiency when the authority is supervising the installation. In Ireland, the Irish Energy Centre publishes the information about the development of energy efficiency. In Sweden the authorities use an annual environment report that is obligatory for the operators.

8.2 Supervision

Most of the countries have an inspection or an audit system carried out by the authorities for energy issues. However, the definition of energy efficiency is not quite clear and there are practical difficulties in enforcement and supervision. The lack of clear definitions and guidelines also has an effect on enforcement and supervision. The supervision of energy efficiency is very difficult, if not impossible. One problem is that general and vague permit conditions are not consistently enforceable and they are difficult to supervise. Secondly, non-binding permit conditions are widely used in the permit procedure, which means that they are not enforceable at all. One solution to the problem

could be the “minimum criteria” for energy efficiency inspections. It was pointed out that there is a need for guidelines on the inspection procedure to be used in the auditing of energy efficiency.

The competent inspectorate is usually the environmental authority (Annex I, Table 86). One exception is Denmark, where the competent authority is the Energy Agency. Auditing or supervising is usually a part of the permitting or supervision process. In Austria, Finland, Portugal and Sweden the inspection or auditing system was not created specially for energy issues. In Denmark an energy management system has been developed to be used by companies entering into an agreement with the Energy Agency. In Finland Motiva is competent for supervision of energy saving agreements. In Ireland the EPA audits licensees. In Poland the Chief Inspectorate for Environmental Protection is the inspection authority. In Germany the supervising authority checks the installation.

The consequences of non-compliance with energy saving measures in the permit vary according to national practice (Annex I, Table 90, Column 6.2.5.1). For example, in France, Germany, Ireland and Lithuania the inspector has the authority to take action. In Germany the company has to pay a fine if it is responsible and culpable or the authority can shut down the installation. In France the conditions of the permit can be reconsidered. The environment inspector can demand that the environmental permit be followed and can impose administrative penalties.

Supervision of energy efficiency in voluntary environmental management schemes is arranged in most of the countries. The certifier determines in nine countries (Finland, France, Germany, Ireland, Italy, Lithuania, the Netherlands, Portugal, the United Kingdom) how to supervise energy efficiency in accordance with EMAS and the ISO 14001 standard. Austria's use of environmental management systems in the supervision process is mentioned in sections 7.2 and 7.3. Neither Poland nor Sweden have established a supervision process (Annex I, Table 87). If the energy saving measures are not fulfilled, most countries impose consequences in accordance with the ISO 14001 standard and EMAS. In France the operator establishes objectives and targets concerning energy savings if he considers that the environmental impact of the activity is significant. (Annex I, Table 90, Column 6.2.5.2) Thus, in Ireland, the Netherlands and the United Kingdom there are no consequences unless the measures are incorporated into the permit (the Netherlands).

Supervision of energy saving agreements is arranged differently in the participating countries (Annex I, Table 88). Denmark has a governmental body supervising the reporting, while in the United Kingdom there are government-appointed verifiers. Finland has a steering committee with representatives from both governmental and non-governmental bodies. In Ireland the supervision system is based on a self-audit scheme, the onus is on the company itself but the Irish EPA may place requirements on the company. In Germany the installations report to RWI (Rheinish-Westfälisches Institut für Wirtschaftsforschung Essen) and this institution supervises energy saving agreements. In the Netherlands the supervision is arranged by Novem (Agency for Energy and the Environment). In Italy the supervision depends on the agreements. Countries also have different consequences for failure to implement the energy saving measures (Annex I, Table 90, Column 6.2.5.3).
Some use tax increases or reimbursing of the tax reduction (Denmark, Germany and the United Kingdom). Denmark also withdraws grants. In Finland the company can be suspended from the agreement. In the Netherlands the permit will be adapted or enforced. The United Kingdom will carry out full site-specific regulation under the IPPC directive due to a breach of the permit condition to hold a certificate. In France, Ireland and Lithuania the violations are not likely to cause negative consequences.

In energy efficiency inspections a good alternative would be self control, meaning that the licensee carries out its own monitoring. As it is in the inspector’s interest that the enforcement of the moni-

toring is done in a certain way, there would be a need for a mechanism where the inspector can influence how the monitoring is done. The licensee should submit a plan to the inspector detailing the scope of energy efficiency audits. It could be included as a part of a permit, which would make it enforceable. The authorities can inspect and verify the reports through the submission of information and the audit process. A similar system has been established under Irish legislation. As the licensee is doing the self-monitoring, the inspectors can supervise the data the licensee gives and the inspector can define which streams should be monitored. At the seminar it was also pointed out that the licensee should be able to verify how the energy is used. A tool to do so could be the energy balance reports.

Voluntary energy saving agreements are in use in some of the Member States. One question is how to supervise the voluntary agreements if they are included in a permit system. The general view is that there should be an obligation to monitor the voluntary energy saving agreements, if they are a part of a permit. The overall view from the seminar was that the voluntary energy saving agreements should not be a part of the permit because the targets of voluntary agreements (continuous improvement) are not suitable for inclusion in a permit system. The voluntary agreement could be regulated by general binding rules (GBRs). They could also be included as a part of the licensees' annual objectives and targets.

9 ACCESS TO INFORMATION AND PUBLIC PARTICIPATION

9.1 General questions about access to information

Public access to environmental information has become an increasingly accepted part of environmental policy throughout the Member States, as was seen already in 1990 by the agreement to a directive on the subject. Access to information and public participation are also growing in importance in environmental permitting. The need to inform the public is essential in an integrated approach. Because the permitting is open to scrutiny, the risks of environmental options being ignored, or poor environmental standards being accepted, are reduced (Explanatory memorandum of the IPPC directive on Article 15). Article 15 of the IPPC directive stipulates specifically access to information and public participation in the permit procedure. In addition the international Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (known as the Aarhus Convention), which the EU is a party to, emphasises these specific rights.

Member States are required to ensure that applications for IPPC permits are made available for public review and comment before a decision is reached. That decision and its subsequent updates must be available to the public (Article 15 (1)). Also, the results of the monitoring of releases as required under the permit conditions must be publicly available (Article 15(2)). There has, however, been some criticism of the fact that there is no requirement, however, for public comments to be taken into account in reaching the decision(Emmot 1999, 39). On the other hand, such a requirement is perhaps only too obvious to be specifically pointed out at the legislative level. The requirements for public release of data are subject to the restrictions set out in directive 90/313/EEC on access to environmental information, which means that material may be withheld on grounds of commercial confidentiality or certain other reasons (Article 15 (4)). Although there may be occasions when data should be protected for reasons of commercial confidentiality, the IPPC directive sends a signal that any such restriction should be the exception rather than the rule (Explanatory memorandum of the IPPC directive on Article 15).

9.2 Access to information in the permit procedure and supervision

The requirements for access to information and public participation were generally seen as difficult to fulfil in the field of energy issues. There are a variety of limitations to access to information. To combine the demands of transparency and the means of the voluntary agreements was also seen as problematic because of the reluctance of many companies to reveal their energy data, especially exact energy figures or energy consumption (Annex I, Table 91).

The means of making data public varies. Public hearings, print newspapers and other channels can be used. The most common way is still to have the authority make the data available. When the issue was under discussion in the seminar, it was pointed out that the traditional means of publishing notices in newspapers and posting information on notice boards of the authorities were generally seen as inadequate for informing the public about the application and the emission data. The Internet was seen as a good and accessible way to promote transparency (Annex I, Table 94).

There are also various limitations in making the data public. These are mostly related to business secrets. Some countries have also protected industrial secrets by restricting the publication of information “if the number of operators is below three or if one operator represents 70 % of energy consumption” in order to protect the operators identity. Also public safety and crime prevention are

often mentioned as reasons to restrict the transparency. There are also countries where no confidentiality clauses can affect environmental issues. (Annex I, Tables 94 and 95).

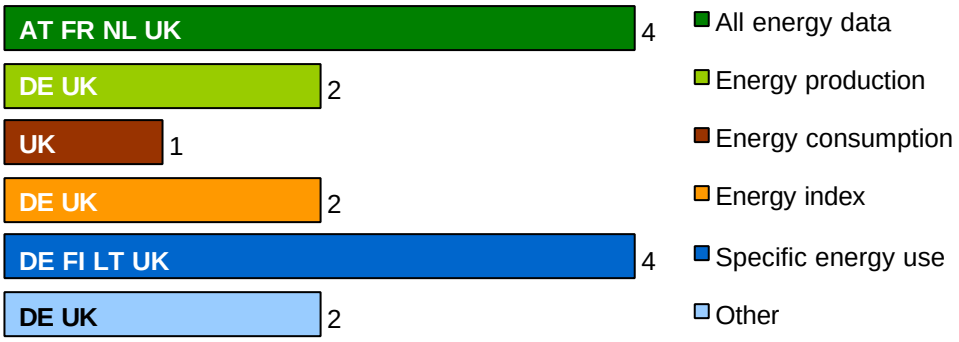

FIGURE 7 (Annex I, Table 96). The nature of data usually declared as confidential.

As mentioned above, the IPPC directive and the Aarhus Convention emphasise the role of public participation. At the seminar in Helsinki the relationships between the participatory rights and energy efficiency issues were discussed. The replies to the questionnaire showed that the differences in national legislation and confidentiality clauses could create, and have created various interpretations of the implementation of the article in question. Yet all, but two participating countries declared, that the Aarhus Convention did not demand changes in their legislation (Annex I, Table 92). Moreover the seminar discussion showed, that the interpretations of what can be declared as confidential, varies in different Member States, which was considered to be very problematic. Altogether there are many practical approaches in this field and the attitude towards transparency is strongly connected to national traditions. Additionally the authorities' point of view can vary from that of the operators'. Therefore it was also pointed out, that general harmonisation of the articles in question and definition of what can be declared as confidential are needed. This could be kept on IMPEL's agenda, to create a common understanding of the issue. General guidelines were regarded as needed, especially when there are different legal systems involved.

9.3 Openness in the voluntary measures

Voluntary measures (voluntary energy saving agreements, EMAS and ISO 14001) are agreements between authorities and the operators. There are some concerns about the role of public participation in these, which are basically agreements between two parties concerning the permitting procedure, but which also includes the rights of the "third parties". The problems were closely related to the companies attitudes and fears in revealing the, naturally important, strategic data. The companies rights are also in question in trying to make the ends of the triangles meet. Problems were also seen in the openness of the voluntary measures from the authorities point of view, as it was stated in one of the replies " In case of voluntary agreements authorities often do not have sufficient information to follow the process of analysing the energy situation and selection of measures" (Annex I, Table 91).

In general, the participating countries of the project saw the certain "lack of transparency" as one of the key difficulties in using the voluntary energy saving agreements in the permitting procedure. The data might yet be available at the branch level or in annual reports, or all data might be entirely

anonymous. If the company has nothing against publicity, specific data can be made public in agreement with the company (Annex I, Tables 100 and 101). The transparency, as it was pointed out, could also serve as a “watchdog” in systems lacking other sanctions. On the other hand, the participating countries suspected that the forms of energy use were not of such great interest to the public as the emission data.

10 ENERGY TAXES

10.1 General questions

Most of the Member States and future Member States in this project have energy taxes (except Ireland and Poland) (Annex I, Table 103). However, in those countries where the taxes are used, they are not necessarily created with environmental purposes in mind.

What is taxed varies in the different countries (Annex I, Table 104). Fuels are taxed in almost all of the countries. CO_2 is taxed in five countries (Denmark, Finland, Italy, the Netherlands and Sweden), gas in six countries (Austria, France, Germany, the Netherlands, Portugal and the United Kingdom), and coal in two of the countries (Germany and the United Kingdom).

In most of the countries the energy taxes are not connected to the nature of the installation (Annex I, Table 105). In Germany the tax for fuel used in installations for co-generation of power and heat is refunded at a rate of at least 70 per cent of usable energy per year. Only the United Kingdom has some exemptions: power generation, primary fuel to refineries, chlor-alkali and aluminium smelting.

Energy taxes could be taken into consideration while allocating allowances for emissions trading. If energy taxes are used, the revenues should be fed back into programmes that promote innovation. Lithuania pointed out in the seminar that emphasis should be put on how the revenues could be used for developing environmental protection. This was widely accepted by the working group.

EU-wide energy taxes have been proposed but a unanimous decision is required. The participants in the working group preferred a harmonisation of energy taxes and charges in Europe, and ideally worldwide.

The question of energy taxes is quite complex so a deeper investigation of this subject is not possible in this context.

10.2 Connections to other systems

None of the countries could see any direct connections between energy taxes and the permit procedure (Annex I, Table 107), while in Denmark there are some connections between energy taxes and voluntary agreements. France and Sweden also have ongoing discussions about the linkage between energy taxes and voluntary agreements. In the United Kingdom an 80 % discount on tax may be possible if entering into a voluntary agreement. In the Netherlands there is an agreement with glasshouse (horticulture) industry about a mitigated rate for a regular energy tax (REB). (Annex I, Table 106)

In Denmark a number of energy intensive enterprises have received a reimbursement, provided they agree to invest in energy saving programmes, under agreements negotiated between the individual enterprises and the authorities. The threat of a full tax liability in the case of non-compliance will act as an effective spur to encourage enterprises to abide by the agreements. Denmark believes that by applying the tax instrument towards the large body of enterprises, reserving the procedure of negotiated agreements for a small fraction of very exposed industries, and, at the same time, using the tax as an instrument in the case of non-compliance in the latter cases, the Danish scheme attempts to combine the best of the two instruments. (Energy Tax on Industry… 1995).

However, the Danish system has probably not considered such advantages in connections between energy taxes and voluntary agreements, maybe because the scheme for making agreements on energy saving is limited in time and will expire in a few years. (Annex I, Table 109). In Denmark very energy intensive companies would have difficulties operating on the competitive international market if taxes on energy use were too high. Therefore, a system has been worked out whereby energy intensive companies can reduce taxes by entering into a binding agreement on energy efficiency. In reality, the lower tax rate is the result of companies receiving a subsidy with which to pay the tax on energy use. To qualify for a lower tax rate, energy intensive companies can enter into an agreement with the Danish Energy Agency which is valid for up to three years. Agreements must be renewed after three years. The agreement system has been established to ensure that these companies use energy efficiently, even though as part of the agreement they are actually taxed at a lower rate. The agreement system is based solely on the green tax system, and cannot be seen as an individual instrument. If the companies were not to pay CO_2 taxes, there would be no incentive for entering into an agreement (The Danish Agreements… 1999).

Some problems and advantages have been seen in those countries that do not have any connections between energy taxes and the other systems. France assumes that there could be advantages in connecting voluntary agreements and the permit procedure, for example, to provide monitoring of energy efficiency. Whereas, there might be some constitutional problems in taxing industries unequally. Portugal supposes that taxes can be an incentive to promote agreements that will help companies to comply with the permits. However, some problems might occur because the taxes are not created for environmental purposes (Annex I, Tables 108 and 109).

Sweden supposes that the connection between energy taxes and voluntary agreements is beneficial, since taxes provide one important incentive to conclude agreements. Apart from this example, it seems as if the three should be kept as separate as possible at the level of implementation and enforcement (Annex I, Tables 108 and 109).

11 EMISSION-TRADING SCHEME

11.1 Greenhouse gas emissions trading scheme

The trading of emissions is a new instrument in environmental policy. The emission-trading scheme is a part of the Kyoto Protocol mechanisms to stop climate change. The European Commission has given a proposal for a directive of the European Parliament and of the Council establishing a trading scheme for greenhouse gas emission allowances within the community and amending the IPPC directive (COM/2001/0581 final). According to this proposal, the directive will at first cover only CO_2 emissions. This directive builds on and is linked to the IPPC directive. In the Member States there are only a few examples of emission-trading schemes, but in Denmark a scheme is already operating and the United Kingdom has a proposal for one (Annex I, Tables 110 and 111). CO_2 emissions are ideal and suitable for trading because they are relatively easy to monitor and they have truly global effects. Emissions trading is not yet generally considered as an instrument for other environmental substances, but there are emission-trading schemes for NOx and SO_2 in the United States and there are some plans to for such also in European countries (see Chapter 13 for more about emissions trading).

In the seminar one of the working groups concentrated on emissions trading. The participants discussed the "Non-paper on synergies between the EC emissions trading proposal (COM (2001)581) and the IPPC directive" (D(02)610019 given at 22.1.2002). In addition it was discussed whether CO_2 could at all be part of the IPPC permit. It was pointed out by the Commission that CO_2 is part of IPPC permitting because of the broad definition of "pollution" of the IPPC directive, even though it is not mentioned in the Annex III of the directive. But, according to the plans for emissions trading, in the future there can be no limit on CO_2 emissions in the IPPC permits. In any case, the greenhouse gas emissions trading will affect the application of the IPPC directive. Until now there has not been a clear picture of how the links between emissions trading and IPPC permitting will work. It was also pointed out that one of the advantages of emissions trading is that reductions can be achieved in a more cost-effective way because market forces will be operating.

A major challenge of emissions trading is how to allocate allowances in national plans. The link to energy efficiency requirements under the IPPC directive needs to be further developed, because it was felt that the link is not entirely clear at present. If the cost of production of energy rises as a result of emissions trading, this will assist energy efficiency requirements under the IPPC directive. It is important to consider the efficient use of energy in the IPPC permits even after the start of the trading scheme.

Of the Member States and the future Member States participating in the project only Denmark is using a CO_2 trading scheme at the moment and the United Kingdom from April 2002 (Annex I, Tables 110 and 111). Denmark is using the trading scheme for power plants. In the Netherlands the possibility of developing a national scheme is presently being studied (at the time of the survey). Austria, Finland, France, Germany, Portugal and Sweden are waiting for an EU-wide trading scheme. Ireland, Italy and Poland had no plans on the issue at the time when the questionnaire for this report was made.

Denmark, Finland, Lithuania, the Netherlands, Sweden and the United Kingdom suppose that the proposed EU-wide CO_2 trading scheme covering some of the most energy intensive IPPC sectors will affect their national plans regarding the permitting system (Annex I, Table 113). Sweden supposes that countries applying the IPPC directive will face the question that CO_2 emissions would have to be separated from the integrated permit procedure and the law on integrated permitting

would have to be altered. Denmark is interested in an EU-wide CO_2 scheme; however, the sectors proposed are different and may cause complications, moreover the new Danish law on tradable CO_2 quotas will have to be modified.

Legal constraints to introducing a CO_2 trading scheme at the national level were not seen as problematic to most of the countries (Annex I, Table 114). In some of the countries introducing such a scheme would require modifying the present legislation (France) or drafting totally new legislation (Germany). In other countries the question is not so clear cut and answers must wait until the EU-wide CO_2 trading scheme is completed, or the countries have studies of this question in progress (Lithuania, Portugal and the Netherlands).

11.2 Relations between a CO_2 trading scheme and the permit procedure

In order to ensure no conflict between an emission-trading scheme and the IPPC directive, the IPPC directive will have to be altered in such a way that the IPPC permit for an installation does not include CO_2 emission limits. However, the trading scheme directive might only partially restrict the efficient use of energy that the IPPC directive requires.

The Member States and future Member States are uncertain about how to take into account tradable emission quotas in the permitting procedure (Annex I, Table 112). This is natural because only a few countries have national tradable emission quotas in use at the moment and because the EU directive is still in the preparatory stage. In Germany there have been discussions on future emissions trading and it is assumed that in the future companies will not be allowed to ignore the BATs. Germany surmises that because of the BATs there will be minimum requirements on energy efficiency measures in each installation. The United Kingdom supposes that the same applies as for voluntary agreements.

One major challenge is how to allocate allowances in national plans. The link to energy efficiency requirements under the IPPC directive must be clarified, as it is not entirely clear at present. If the cost of energy production rises as a result of emissions trading, this will make the energy efficiency requirements under the IPPC directive more attractive. It is important to continue to consider the efficient use of energy in the IPPC permits.

12 CONCLUSIONS

12.1 Key difficulties in the consideration of energy efficiency

Energy efficiency is an issue to be considered among other environmental impacts in the permitting procedure. Energy issues are very complex and highly experienced people are required for assessment and evaluation. Industry is likely to employ such persons whereas authorities, including permitting bodies, not always possess such competence. In this project, according to the replies to the questionnaire and the discussions in the seminar, the following issues were seen as key difficulties.

1) The definition

Defining energy efficiency in practice is considered to be very difficult because of the differences in the nature of the installations to which energy efficiency applies. Overall guidance on energy efficiency is not possible, but the solution could be found in sector-wise guidance and efficiency could be looked at on a case by case basis. The definition of efficient use of energy must balance the reduction of energy use with the other environmental impacts; reducing emissions of pollutants can for example, increase energy consumption. Also, the lack of references and inspection methods make it more difficult. The economic aspects play a more dominant role than in the other environmental fields. Energy efficiency in environmental permitting is not a concept familiar to the environmental authorities. There is, therefore no experience of how to define efficient energy use in each individual case.

2) Binding permit conditions

One of the most difficult questions was defining a binding permit condition for energy efficiency. In most cases it is not considered possible to set up enforceable conditions for energy efficiency in a permit for an individual installation. The energy data could also be confidential. The permit conditions are not always concrete enough. It is difficult to make a specific condition for energy usage, for example, energy used per produced unit, because of many varying variables, such as basic consumption, several product lines and fast changes from one product to another.

3) Enforcement and supervision

As a clear definition of energy efficiency is not available, direct enforcement and supervision by environmental authorities is more difficult. Too general and vague permit conditions are not enforceable and they are difficult to supervise. Non-binding permit conditions are not enforceable at all. There is also a lack of knowledge among inspectors.

4) Publicity/confidentiality

In some countries industry is prepared to disclose more information than in others and it is a slow process to change attitudes. Data on energy issues might be considered as sensitive. The operator can of course separate the information in the applications into confidential and non-confidential. In France the energy authority will not publish any results on energy consumption if the number of operators is below three or one operator represents about 70 % of the consumption. In Austria concrete data are only available for legitimated parties in the permit procedure.

5) Relations to emissions trading

Greenhouse gas emissions trading will affect the application of the IPPC directive. Until now there has not been a clear picture of how the links between emissions trading and IPPC permitting will work. The interpretation has been that CO_2 is not applicable in the permit procedure. It was anyhow pointed out that CO_2 falls within the IPPC directive's broad definition of pollution (Art. 2 (2)).

6) Voluntary systems versus permit

Also the interrelationship between the voluntary agreements and permit conditions is part of this problem. The targets of voluntary agreements and the means of permitting do not always coincide, for example, the requirement of continuous improvement is too vague as a permit condition. The permit conditions should be based on BAT. The participants had different opinions on the use of voluntary energy saving agreements as a part of the permit. Some countries saw it as impossible to link the voluntary agreement system and permit system together, while some thought that there could be a partial connection for some detailed issues.

7) Lack of information and expertise

Generally there is a lack of expertise and information on how to apply energy efficiency in the permit procedure. The BREFs contain some but not enough process specific energy information. The participants in the seminar pointed out that there is not enough co-operation between energy and environmental authorities. The auditing information from the voluntary energy saving agreement is not available in formats that could be used in the permit procedure. There is not enough training for practical implementation of the energy efficiency demand.

12.2 Good practice

1) The definition

It is good practice to create practical guidelines to define energy efficiency in order to clarify the issue. Overall guidance of energy efficiency is not possible, but the solution could be found in sector-wise guidance and, in general, energy should be looked at on a case by case basis. In France there are some sector-wise general binding rules and in the United Kingdom non-statutory guidance. Several approaches are good and can be used in parallel. As good practical solutions benchmarking, pinch technology and energy balance checking were mentioned.

2) Beforehand discussions and application forms

A good application is a requirement for a smooth permitting process. In order to create good applications prior information exchange between the operator and the authorities is good practice. A good practice would be that, application forms where the information requirements concerning energy efficiency are listed should be available on the Internet. In Finland and in Portugal there are such application forms. The Finnish application form is in Annex III.

3) Energy efficiency as a permit condition

This project could not identify any good practice for establishing binding permit conditions. However, the final report gives some concrete examples of more or less binding permit conditions. The permit condition or the text in the descriptive part could also be linked to voluntary energy saving agreements, which functions very well in the Netherlands and Finland.

4) BREFs

It is good practice for the environmental authorities to use the BREFs which contain a considerable amount of information on energy. The most specific information is available on energy consumption. There is less data on energy saving and energy recovery techniques.

5) Monitoring and supervision

Monitoring and supervising of energy efficiency in permits is very difficult due to often general and vague permit conditions. In inspections of energy efficiency good practice is self control under the precondition that the inspector can influence the monitoring practices of the operator. Because of the lack of energy knowledge among the permit authorities and inspectors, there is a need for more co-operation between the energy and environmental authorities.

6) Audits

Information on energy audits can be used as a tool to give information to the environmental authorities. As in Ireland the planning of the audit of energy efficiency of the site should be developed together with the environmental authority. The audit report should also be available on site for environmental inspectors and the summary of audit findings should be submitted as a part of any annual environmental report.

7) Co-operation

Co-operation between energy and environmental authorities in energy efficiency issues is good practice and should be developed. Each authority has special knowledge that the others may need or could use in their work. Especially in this case development of co-operation is highly recommended since energy efficiency is not a very clear and simple concept. The development can be done in several ways such as joint seminars, working groups and co-operation in drafting the environmental legislation. Audit reports can be used as a tool to give information to the environmental authorities. Also, co-operation between the Member States and future Member States in implementing the requirement on energy efficiency is good practice and the IMPEL Network as such promotes this kind of co-operation.

8) Access to information and public participation

It is good practice to have transparency in environmental permitting concerning energy efficiency, too, so that the Aarhus Convention really is implemented in the same way in different countries. Good practice is that the application forms and the permits are available on the Internet. The development of general guidelines for what can be declared as confidential is also essential. Transparency in all voluntary measures is also good practice.

9) Voluntary measures

The environmental management systems provide a good tool for managing energy issues. The policy and targets set by the company should not be transferred as such to the permit. This could negatively affect the companies' interest in setting targets and even in using environmental management systems. There should also be clear and attractive incentives for the companies to join the management systems.

It is in itself good practice when voluntary energy saving agreements are made for most of the industries in a country, which should lead to energy savings and the efficient use of energy. Concrete measures are already included in the agreements and should be followed up.

10) Training

As the environmental authorities in general do not have enough knowledge of energy efficiency it is good practice to provide general training for environmental authorities and to raise the level of knowledge. It is also good practice to create fact sheets which contain information on energy efficiency as a tool for environmental permitting, supplementing the BREFs and any national BAT guidance. Good practice is that the environmental authorities are provided with information from the voluntary energy audits made by energy experts.

12.3 Proposals for further IMPEL work

- There are not many concrete examples of permit conditions concerning energy efficiency from the participating countries. This issue should be followed up after some years when a significant share of all large industries have had their new permits granted.
- General guidelines of what can be considered as confidential in the permit procedure especially in energy issues should be developed.
- Sector specific BREFs with more information on energy efficiency issues, a horizontal energy efficiency BREF and a cross-media BREF where the emissions are linked also to the need of energy should be developed.
- The link between the permit and voluntary measures should be clarified.
- The understanding of the link between the permit and the future greenhouse gas emissions trading scheme should be improved.
- There is also a need for guidelines on the inspection procedure to be used in the auditing of energy efficiency.

ACRONYMS AND ABBREVIATIONS

AC	Alternating current
ACkWh	Kilowatt hour (alternating current)
ACAE	European Automobile Manufacturers Association
ADEME	Agence de l'Environnement et de la Maitraise de l'Energie, Agency for the Environment and Energy
Adt	Air dry tonne
AMVB	Smaller Dutch installations with GBRs
ANPA	Italian National Environmental Agency
BAT	Best Available Technique
BOF	Basic oxygen furnace
BOD	Biochemical oxygen demand
BREF	Best Available Techniques Reference Document
C	Carbon
ºC	Degree Celsius
CCGT	Combined Cycle Gas Turbine
CCL	Climate Change Levy
CCLA	Climate Change Levy Agreement
CDM	Clean development mechanism
CHP	Combined heat and power
Cl_2	Chlorine
CO_2	Carbon dioxide
COD	Chemical oxygen demand
COG	Coke oven gas
COM	European Commission
DC	Direct current
DRIRE	French Regional Direction of Research, Industry and the Environment
EAF	Electric arc furnace
EC	European Council
ELV	Emission Limit Value
EMAS	Eco-Management and Audit Scheme (EC regulation 761/2001)
EMS	Environmental management system
ENEA	Italian National Agency for New Technology, Energy and the Environment
Environment DG	European Commission Environment Directorate-General
EPA	Environmental Protection Agency (Denmark, Ireland and Sweden)
ETS	Emissions trading scheme
EU	European Union
EURELECTRIC	Union of the Electricity Industry
GBR	General binding rule
GHG	Greenhouse gas
GJ	Gigajoule
HELCOM	Helsinki Commission
IMPEL	European Union Network for the Implementation and Enforcement of Environmental Law
IPPC	Integrated Pollution Prevention and Control (directive 96/61/EC)
ISO 14001	The Standard of the International Organization for Standardization (ISO) for environmental management system
J	Joule

JI	Joint implementation
kWh	Kilowatt hour (1 kWh = 3.6 MJ)
LS	Liquid steel
MAC	Marginal abatement cost
MEC	Marginal external cost
MJ	Megajoule
MJA	Dutch long-term agreement on energy efficiency
Motiva	Energy Information Centre for Energy Efficiency and Renewable Energy Sources, Finland
Ni	Nickel
NO_x	Nitrogen oxide
PJ	Petajoule
REB	Dutch Regular Energy Tax
Novem	The Netherlands' Agency for Energy and the Environment
PAMs	Policies and measures
PARCOM	Paris Commission
RCF	Recycled fiber
RWI	Rheinish-Westfälisches Institut für Wirtschaftsforschung Essen
SAVE	Specific Actions for Vigorous Energy: a programme adopted by the European Commission in October 1991
SEC	Specific energy consumption
SO_2	Sulphur dioxide
t	Metric tonne
toe	Oil equivalent tonnes
TWG	Technical working group
VDI	Verein Deutscher Ingenieure, Assosiation of German Engineers
VOC	Volatile organic compound

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ANNEX I: COMPILATION OF THE ANSWERS TO THE QUESTIONNAIRE

Return of completed questionnaire

Table 0	Questionnaire returned (EU Member States, AC-IMPEL and Norway)	Responsible persons	Institution
Austria	Yes	Otto-Werner Schaubschläger	Municipality of Linz / Department for Environmental Protection and Nature Conservation
Belgium	No		
Denmark	Yes	Jørgen Nielsen Anette Christiansen	Environmental Protection Agency (Miljøstyrelsen)
Finland	Yes	Emelie Enckell Pentti Puhakka	Uusimaa Regional Environment Centre Ministry of Trade and Industry (MTI)
France	Yes	Philippe Orignac	Ministère de l'aménagement du territoire et de l'environnement
Germany	Yes	Ulrich Buntrock	Staatliches Umweltamt Herten, North-Rhine-Westphalia
Greece	No		
Ireland	Yes	Sean Scott	Environmental Protection Agency
Italy	Yes	Alfredo Pini	National Environmental Agency (ANPA)
Luxembourg	No		
The Netherlands	Yes	Frans Bruinsma	Inspectie milieuhygiëne
Portugal	Yes	Paula Gama and Sofia Simões	General Directorate of Environment (Environmental Institute)
Spain	No		
Sweden	Yes	Erik Nyström and Mikael Hägglöf	Swedish Environmental Protection Agency
The United Kingdom (England and Wales)	Yes	Maggie Dutton	Environment Agency
Bulgaria	No		
Cyprus	No		
Czech Republic	No		
Estonia	No		
Hungary	No		
Latvia	No		
Lithuania	Yes	Vaclovas Beržinskas	Lithuanian State Environmental Protection Inspection
Malta	No		
Norway	No		
Poland	Yes	Krystyna Panek	Ministry of the Environment, Department of Environmental Protection
Romania	No		
Slovakia	No		
Slovenia	No		

1 LEGAL BACKGROUND

1.1 Implementation of the IPPC directive

1.1.1 Has the IPPC directive been implemented in your country?

Table 1	Yes or no	Please specify
Austria	Yes	The IPPC-directive has been implemented in our federal legislation in different sectoral laws (amendments of the Trade and Industry Act, Fed. Law Gaz. I No. 88/2000 (Sec. 77a, 81a - 81d, 356a, 359b (1), the Waste Management Act[1)], Fed. Law Gaz I Nr. 90/2000 (Sec. 29b - 29d, 45c (1) and (2)), the Mining Code, Fed. Law Gaz I No. 38/1999 and Fed. Law Gaz. I 21/2002 (Sec. 121 and 121 a-e). For certain sectors (intensive farming) the competence lies with the provinces (Länder). They have passed either amendments of sectoral laws or "IPPC-Acts". 1) The "Waste Management Act 2002", Fed. Law Gaz. I No. 102/2002, will enter into force on 2nd November 2002 and replace the quoted act. The respective sections will get different numbers (Sec. 40, 43 (3), 47 (3), 57, 60, 65, 78 (5), Annex 5).
Denmark	Yes	See act no. 369 of 2nd June 1999, amending the environmental protection act (integrated prevention and pollution control and consultation of employees etc.) and statutory order from the ministry of environment and energy no. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1st February 2000 (attached).
Finland	Yes	Environmental Protection Act 1st March 2000.
France	Yes	The implementation of the IPPC directive in France relies on an act, a decree and a ministry decision that are detailed below. In France, most of the legislation corresponding to IPPC directive was enforced at the end of the 70's. The Environment Code provides the backbone of the legislation. According to the level of danger and perturbation can cause, installations are submitted to: - environmental permit, if the level is important, - declaration, if the level is feeble but noticeable. The Environment Code states that a decree must list such installations. IPPC installations belong to the list of installation submitted to environmental permit. The environmental permit procedure is described within the Environment Code (from art. L. 512-1 to art. L. 512-7).
Germany	Yes	By the Gesetz zur Umsetzung der UVP-Änderungsrichtlinie, der IVU-Richtlinie und weiterer EG-Richtlinien vom 3.8.2001 ("Artikelgesetz") (BGBl. I S. 1950) 1 (act with which several environmental laws are changed)…
Ireland	Yes	It requires an amendment of the EPA ACT 1992.
Italy	Yes	IPPC implementation law for existing installations has been issued (DL 372 on August 4th 1999). Provisions will be considered by EIA legislation.
Lithuania	No	
The Netherlands	Yes	Type and quantity of energy used/generated (Wet Milieubeheer, art 5.1, Inrichting en vergunningenbesluit).
Poland	No	IPPC directive has been already transposed into Polish legislative system by acts: Environmental Protection Law (will come into force on 1 October 2001, articles concerning IPPC – on 1 January 2002), Act of on the Introduction of the Environmental Protection Act, the Waste Act and Amending Certain Acts (will come into force on 1 October 2001) and a number of executive orders (will be issued by the end of 2001).
Portugal	Yes	Decree-Law (DL) 194/2000 from 21st April 2000.
Sweden	Yes	The IPPC-directive was implemented in Swedish legislation through the Environmental Code (SFS 1998:808), which entered into force on January 1, 1999.
The United Kingdom	Yes	UK legislation made on 21st July 2000.

1.1.2 Did the implementation of the IPPC directive require or will it require specific changes in your legislation concerning energy efficiency?

Table 2	Yes or no	Please specify
Austria	Yes	For IPPC installations (new installations and substantial changes of installations) energy efficiency will be part of the permit (either because of the application or as permit con-

		ditions).
Denmark	No	
Finland	Yes	See below.
France	Yes	The implementation of the IPPC directive required some changes in our legislation concerning energy efficiency at decree level and at ministry decision level.
Germany	Yes	The Bundes-Immissionsschutzgesetz (BImschG =Federal Immission Control Law) and the 4. and 9. decree based on this law had to be changed/supplemented.
Ireland	Yes	As above. The new EPA Act is currently under review and has not been implemented into Irish legislation yet.
Italy	No (in principle)	Minor legislative acts could be required during the process of IPPC enforcement.
Lithuania	No	
The Netherlands	No	Already implementing with the implementation of the Wet Milieubeheer (Wm) in 1993.
Poland	-	See 1.1.1
Portugal	No	Some of the existing legislation on energy efficiency might be adapted in order to ensure that its demands are coherent with the ones likely to be imposed by the more demanding IPPC permit.
Sweden	No	The Code covers the use of resources such as energy
The United Kingdom	Yes	The legislation includes specific energy efficiency requirements for industry in addition to general existing requirements.

1.1.3 How has Article 3 (d) of the IPPC directive been or how will it be implemented in your legislation?

Table 3	Act, Decree or Ministry Decision	Please specify the wordings of the provision
Austria	Law (Section 77a of the Trade and Industry Act, Section 29 b (6) of the Waste Management Act, Section 121 of the Mining Code	The exact translation of Article 3 (d) of the Council Directive: "Energy is used efficiently" was implemented in the above mentioned laws.
Denmark	Statutory order	See statutory order from the Ministry of Environment and Energy no. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000, Part 7, §13, stk. 2, 1)
Finland	Act, EPA 42 § 2 mom. Decree, EPD 9 §, 2 mom., item 3; 19 §, 3 mom.; 37 § item 6	No Ministry Decision, but a common understanding between Ministry of the Environment and Ministry of Trade and Industry (MTI), according to which the companies' report on the implementation of voluntary energy saving agreements (see chapter 5) are available to the supervising environmental authority and included in the permit applications. *Environmental Protection Act 42 § 2 mom*: "Activities may not be located in conflict with a detailed local plan. In addition, the provisions of section 6 apply to location." *Environmental Protection Decree 9 § 2 mom., item 3* : " Permit applications must also include the following information relevant to consideration of the application insofar as is applicable bearing in mind the nature and impacts of the activities:…information on proposed energy use and an assessment of energy efficiency." *Environmental Protection Decree 19 § 3 mom.:* "Where necessary, the permit decision must also indicate how environmental management systems or measures and reporting based on energy-saving agreements have been taken into account in setting the terms of the permit. The decision must also mention the provisions of section 56 of the Environmental Protection Act." *Environmental Protection Decree 37 § item 6:* "In assessing the best available techniques referred to in section 3, paragraph 1, subparagraph 4 of the Environmental Protection Act, the following factors shall be taken into consideration: …energy efficiency."
France	Decree (décret n°77-1133 du 21 septembre 1977 modifié)	The decree n°77-1133 was modified by the decree n°2000-258 quoted above in order to implement the article 3 (d).

Germany	Act	Installations, which have to be permitted on behalf of this law (annotation: that includes all IPPC installations) have to be constructed and operated to achieve a high level of protection for the environment taken as a whole by... use of energy economically and efficiently. (Art. 5 BImschG)
Ireland	Same as above. However the requirements of Article 6 "application for permits" are being met in the current IPC application procedure for a permit. Facilities already licensed before the directive will be reviewed once the IPPC directive is implemented into Irish Law.	The following is the wording of the IPC licence provision for new licences: Energy Use 4.1. The licensee shall carry out an audit of the energy efficiency of the site within one year of the date of grant of this licence. The licensee shall consult with the Agency on the nature and extent of the audit and shall develop an audit programme to the satisfaction of the Agency. The audit programme shall be submitted to the Agency in writing at least one month before the audit is to be carried out. A copy of the audit report shall be available on-site for inspection by authorised persons of the Agency and a summary of the audit findings shall be submitted as part of the Annual Environmental Report. The energy efficiency audit shall be repeated at intervals as required by the Agency. 4.2. The audit shall identify all opportunities for energy use reduction and efficiency and the recommendations of the audit will be incorporated into the Schedule of Environmental Objectives and Targets under Condition 2.2 above.
Italy	Decree. Refers to Decree 372/99 Art. 3	As in the Directive.
Lithuania	Ministry Decision	Article 3 is transposed to IPPC Permitting system, also particular measures are placed in to Wastes reducing plan. See 1.3.1.
The Netherlands	Act	Care for energy-efficient operation (art. 1.1.2 Wm).
Poland	Act	Environmental Protection Law art. 143: "Technology applied in newly set up or essentially altered installations and facilities should comply with requirements which setting out is driven in particular by: (...) 3) effective energy generation and consumption" art. 204: "1. The installations which the integrated permits are required for shall comply with environmental protection requirements which result from the best available technique."
Portugal	Decree	In DL 194/2000 the article 8 defines the operator obligations and uses basically the same wording of the directive. No further legislation was enacted.
Sweden	Act	"Persons who pursue an activity or take a measure shall conserve raw materials and energy and reuse and recycle wherever possible. Preference shall be given to the use of renewable energy sources." (Chapter 2, section 5 of the Code).
The United Kingdom	Ministry Decision	Regulations made under the Act include the following: *Conditions of permits: general principles* Regulation 11. – (1) When determining the conditions of a permit, the regulator shall take account…in the case of a permit authorising the operation of a ...installation…additional general principles set out in paragraph (3)…(3) The additional general principles referred to in paragraph (1) in relation to a permit authorising the operation of a…installation…are that the installation …should be operated in such a way that…(b) energy is used efficiently.

1.1.4 How has Article 6 (1) of the IPPC directive as far as the second and eighth indents are concerned (i.e. energy used or generated and measures planned to comply with the obligation to use energy efficiently) been or how will it be implemented in your legislation?

Table 4	Act, Decree or Ministry Decision	Please specify the wordings of the provision
Austria	Law	The translation of Article 6 (1) of the Council Directive was implemented in the Law on Trade and Industry (Article 356a), the Law on Waste Management (Article 29b).
Denmark	Statutory Order	See statutory order from the Ministry of Environment and Energy no. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000. Annex 2, F18, F19 and G24
Finland	Decree, EPD 37 §	*Environmental Protection Decree 37 §:* "In assessing the best available techniques referred to in section 3, paragraph 1, subparagraph 4 of the Environmental Protection Act, the following factors shall be taken into consideration: 1) reduction of the quantity and harmful impact of waste; 2) the hazard level of em-

		ployed substances and the scope for using less hazardous alternatives; 3) the scope for recovery and reuse of substances used and waste generated in production processes; 4) the quality, quantity and impact of discharges; 5) the quality and consumption of raw materials used; 6) energy efficiency; 7) prevention of operational risks and the risks of accident, and damage limitation in the event of an accident; 8) the time needed for introducing the best available techniques and the importance of the planned time for launching operations, plus the costs and benefits of limiting and preventing discharges; 9) all impacts on the environment; 10) all the methods in use on an industrial scale for production and for controlling discharges; 11) developments in technology and natural science; 12) information on best available techniques published by the Commission of the European Communities or international bodies."
France	Decree (décret n°77-1133 du 21 septembre 1977)	The decree n°77-1133 was modified by the decree n°2000-258 quoted above in order to implement the article 6 (1).
Germany	Decree	The application has to include a description of measures to achieve an economical and efficient use of energy, in particular to achieve a high energetic efficiency, to reduce loss of energy and to use (by-)generated energy. (Art. 4d 9th Decree to the Federal Immission Law)
Ireland	Act	The paragraph above specifies how the Irish EPA is adopting Article 6 (1) of the IPPC directive. However the new Irish EPA Act replacing the EPA Act of 1992 is currently at the draft stage so a wording on the provision is not available.
Italy	Decree. Refers to Decree 372/99 Art. 4	As in the directive.
Lithuania	Ministry Decision	These provisions are transposed to our legislation as it is in the directive.
The Netherlands	Act	Type of energy used/generated (art 5.1 Inr, en verg Besluit WM).
Poland	Act	Environmental Protection Law, art. 184 para 2: "Application for granting permit shall include: (...) 9) information on energy used or generated by the installation"
Portugal		Apart from the wording in DL 194/2000 no other provision was or is planned to be made.
Sweden	Act	An application "shall contain […] any information that is necessary for an assessment of compliance with the general rules of consideration laid down in chapter 2" (Chapter 22, section 1, para. 1.3 of the Code).
The United Kingdom	Act and Regulations	Schedule 4 Grant of Permits Part 1 Application for Permits – (1) An application to a regulator for a permit… shall contain the following information… …(f) the raw an auxiliary materials and other substances and the energy to be used in or generated by the carrying out of the activities …(k) a description of any proposed additional measures to be taken to comply with the general principles set out in regulation 11.

1.1.5 How has Article 9 (1) of the IPPC directive been or how will it be implemented in your legislation?

Table 5	Act, Decree or Ministry Decision	Please specify the wordings of the provision
Austria	Law	Section 77a (1) of the Trade and Industry Act, Section 121 (1) of the Mining Code and Section 29b (6) of the Waste Management Act provide that inter alia the efficient use of energy is a criterion for the permit.
Denmark	Statutory Order	See statutory order from the Ministry of Environment and Energy no. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000. Part 7, §13 and 14.
Finland	Act, EPA 43 §, 3 mom. Decree, EPD 19 §, 3 mom.	*Environmental Protection Act 43 § 3 mom.:* "When permit regulations are issued, the nature of the activity, the properties of the area where the impact of the activity shows, the impact of the activity on the environment as a whole, the significance of measures intended to prevent pollution of the environment as a whole and the technical and financial feasibility of these actions shall be taken into account. Permit regulations concerning the prevention and limitation of emissions shall be based on the best available technology. In addition, energy efficiency and precautions, pre-

		venting accidents and limiting their consequences shall be taken into account as needed." *Environmental Protection Decree 19 § 3 mom.:* "Where necessary, the permit decision must also indicate how environmental management systems or measures and reporting based on energy-saving agreements have been taken into account in setting the terms of the permit. The decision must also mention the provisions of section 56 of the Environmental Protection Act."
France	Act (Code de l'environnement art. L 512-1 & art. L 512-2) Decree (décret n°77-1133 du 21 septembre 1977)	The exact wording is even longer than the previous ones. An electronic copy of the French environment code is available at the web site aida.ineris.fr that is run by INERIS, a public institute that depends on the ministry of environment.
Germany	Act, Decree	The permit is to be granted, if it is verified, that the obligations of Art. 5 BImschG are met (Art. 6 BImschG). The permit can be connected with conditions which ensure the fulfilling of the obligations mentioned in Art. 6. The permit can be connected with conditions as far as necessary to assure that the operator will meet the obligations of Art. 5 BImschG and of other environmental, safety and health etc. laws that refer to the installation.
Ireland	Act	As above.
Italy	Decree. Refers to Decree 372/99 Art. 5	As in the Directive.
Lithuania	Ministry Decision	All general provisions mentioned in Article 3 of the Directive and requirements of BAT set in Article 10 are transposed in to Lithuanian legislation. The way of implementation of these requirements is described in the Programme for the implementation of IPPC Directive, approved by Order of Ministry of Environment on 26 February 2001, No.117.
The Netherlands	Ministry Decision	Consider measures from energy plans as the basic measures for the permit (Circulaire Energie in de Milieuvergunning).
Poland	Act	Environmental Protection Law, art.188 para 2: The permit shall specify:(...) 4) type and quantity of consumed energy, materials, raw-materials and fuels 5) the sources of origination, of the sites of substance and energy release into the environment"
Portugal		Apart from the wording in DL 194/2000 no other provision was or is planned to be made.
Sweden	Act	"A judgement for granting a permit shall, where appropriate, include provisions concerning any necessary measures relating to the management of land, water and other natural resources;" (Chapter 22, section 25, para. 1, 9th indent of the Code)
The United Kingdom	Act and Regulations	Regulation 12. –(1)... there shall be included in a permit-…. (b) (ii) such other conditions…when take with the condition applied in paragraph (10), for the purpose of ensuring a high level of protection of the environment as a whole, taking into account the general principles set out in Regulation 11. Paragraph (10)…there is implied in every permit a condition that... the operator shall use the best available techniques for preventing or, where that is not practicable, reducing emissions from the installation.

1.1.6 Has Article 9 (8) of the IPPC Directive (general binding rules) been used, or has its use been considered to implement IPPC requirements on energy efficiency?

Table 6	Yes or no	Please specify
Austria	No	There are general binding rules for certain categories of installations (ordinances for certain sectors according to the Trade and Industry Act or the Waste Management Act) but not specifically for the efficient use of energy.
Denmark	No	
Finland	No	
France	Yes	The environment code (art. L. 512-5) states that general rules can be imposed by the ministry of environment. In France, running a IPPC plant means the manager has to obtain an environmental permit that is delivered by the local representative of the govemment (after public consultation and the advice of environmental authority) according to local environmental conditions. Nevertheless, at national level, a binding guidance is

		provided. It will be referred to binding guidance when talked about "general binding rules". Different ministry decisions sector wise (glass industry, combustion plants, cement industry, paper industry, incineration plants or general provide binding guidance to limit the environmental impact of a plant. There are some consideration on energy efficiency in the guidance.
Germany	No	Not yet because of the political goal to meet the CO_2-reduction regarding the Kyoto-protocol by voluntary agreements (see Chapter 5). Before IPPC there have already been GBR for steel mills and waste incineration plants.
Ireland	No	
Italy	No	Article 9(8) of the Directive has been implemented in the legislation but not yet used. A GBR approach has been previously used in some cases, particularly in the field of pollutant monitoring rules.
Lithuania	Yes	IPPC requirements, including energy efficiency, are transposed in to legal document named "Regulation on IPPC permitting" and supplementary documents. There is a plan to develop General Binding Rules (GBR) for appropriate branches of industry. Requirements for energy efficiency to be included to these GBRs.
The Netherlands	Yes	We have general rules for smaller installations like offices, shop etc.
Poland	No	
Portugal	No	
Sweden	Yes	The use of general binding rules is currently under consideration as one means of partly implementing Art. 5 of the Directive.
The United Kingdom	Yes	The provision is being considered as a means of implementing energy efficiency requirements.

1.1.7 Were there, or are there, any problems in implementing the provisions on efficient energy use of the IPPC directive in your legislation?

Table 7	Yes or no	Please specify
Austria	No	
Denmark	No	
Finland	Yes	Thus far, very little reference data has been available and there is a lack of experience in how to use the data.
France	No	Those provisions on energy efficiency were quite new in environmental regulation but the existing legal frame was flexible enough to integrate them. The decree n°2000-258 modifying the decree n°77-1133 modified was the most important step towards implementation.
Germany	No	No specific problems. The only problem is that of loss of time as the German govemment intended first to implement the IPPC issues together with all of the other existing German environmental provisions in different acts in only one system (Umweltgesetzbuch-Statute Book of Environmental Law). This proved at last to be impossible for constitutional reasons, so that the government proposed a separate bill for implementing only IPPC (and EIA) issues. So the parliamentary process took more time for the parliamentary process.
Ireland		The legislation is at draft stage and has not been implemented yet, however there should not be any major issues in implementing the IPPC provisions on Energy use.
Italy		NO ANSWER
Lithuania	No	
The Netherlands	Yes	When the IPPC came there was already an existing voluntary agreement with the major energy consuming branches of industry. This arrangement had to linked with the permit by means of a paper of the minister of environment: "de Circulaire: energie in de milieuvergunning". In the meantime all other approaches have surfaced. A complete description is given under the comment of this chapter.
Poland	-	The requirement of energy efficiency is general only, it is difficult to define the details.
Portugal	No	
Sweden	No	Legislative implementation has caused no such problems.
The United Kingdom	Yes	There are existing provisions for energy efficiency in the UK which already apply to installations covered by the Directive.

Comments:
Denmark:
The problems arise when the provision in the statutory order is to be implemented in the environmental permit. Only a few BREFs have until now dealt with energy efficiency.

The Danish reimbursement scheme for the CO2-tax on industry provides subsidies for companies making an agreement on energy saving measures with the Energy Agency (formerly an agency within the Ministry of Environment and Energy, now a part of the (restructured) Ministry of Industry and Economy). The agreement is not a part of environmental permit. The Energy Agency has published a number of pamphlets and guidelines on energy saving measure in order to inspire companies and an 'Energy Management Scheme' like the known voluntary environmental management schemes.

The Netherlands:
Energy measures are implemented in general on the base of the environmental law the "Wet milieubeheer" (Wm). The way this happens depends on the category installation and whether a company has joined a voluntary reduction agreement:

a. Benchmarking: applicable for biggest energy consumers (> 0,5 PJ p/a)
b. MJA: applicable to other big (mainly industrial) consumers (covers together with a about 90 % of total energy consumption of the industry)
c. Non MJA-companies: all remaining installations with the exception of (d)
d. AMVB-installations (general binding rules for smaller installations and buildings)

At a. Installations are compared with the world best performing installations. In case their performance is less then they have to make an improvement plan. The measures will be implemented in the Wm-permit. About 200 companies have joined this scheme and are now in the process of starting the comparison.
At b. In 1992 this voluntary agreement started, aiming at reduction of specific energy consumption (about 2 % per year, depending on the branch). This agreement has been implemented in about 29 industrial branches (from refineries to all kind of food industries) and 14 non industrial branches like the insurance business, banking, hospitals etc and agricultural branches like glasshousing. The overall reduction in 1999 was 20 % in comparison to 1989. In most agreements participants are obliged to analyse the situation and make plans for improvement. These plans are approved by the national bureau of energy savings (NOVEM). Measures from approved plans are implemented in the Wm-permit.
At c. Companies or branches that did not join the MJA-agreement are requested to apply for an adaptation of Wm-permit. Measures can be proposed by the applicant but will be selected by the authority. Guidelines for this process and possible measures are made available by means of technical information sheets. The selection depends largely on the payback-period of the required investment (generally 4 years).
At d. This applies mainly to smaller installations exempted from the need for Wm-permit. Examples are: offices, restaurants, shops, glasshouses

Sweden:
It is too early to evaluate how this legislation has functioned in practice.

1.2 Definition of efficient energy use

1.2.1 Is there or will there be a reference to or a specific definition of efficient use of energy in your legislation?

Table 8	Yes or no	The exact wording of the provision:
Austria	No	Not yet.
Denmark	No	
Finland	No	
France	No	The closest to a definition is provided by the act on air and rational use of energy that recommends to save on energy to reduce or suppress air pollution (including green house gases).
Germany	Yes*	On the level of law/decree: *Only for waste incineration in the 17. decree to the BImschG: (translated): "…generated heat is to be used in installations, as far as this is technically possible and demandable…as far as in that case the heat is not used, it has to be transformed in electrical energy if more than 0,5 MW could be produced."
Ireland	Yes	The exact wording is not finalised as the legislation is at the draft stage.
Italy	Yes. Law 10.91	A mix of measures towards the saving of energy, the proper use of energy sources, the improvement of technologies for energy use or transformation, the use of renewable and the replacement of import energy source.
Lithuania	Yes	Regulations on IPPC permitting (Articles No. 8.4; 11.7; 35.1) sets requirements for energy efficiency.
The Netherlands	No	The need for taking measures is related to a pay back time of the measure of five years. If this kind of measures can not be defined within the process or factory, energy use is

		stated efficient.
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom	No	

1.2.2 Does your country provide any guidance on defining efficient use of energy?

Table 9	Yes or no	What kind of guidance?
Austria	No	Not yet.
Denmark	Yes	Sector energy analysis and some horizontal guidelines (e.g. on ventilation, heating, compressors and electric light) from the Energy Agency.
Finland	Yes	"Energy efficiency in the environmental permit procedure and energy saving Agreements" Energia-Ekono Ltd., MTI, FEI 1999; "Background report on energy efficiency in environmental permit procedure" MoE 2001
France	Yes, partly	The act on air and rational use of energy provided a frame to give some guidance on energy efficiency. Based on the law, a imposed minimal yields for boilers whose power lies between 400 kW and 50 MW. A second imposed regular controls of the yields.
Germany	Yes	No guidance for authorities so far, but Paper of UBA, Berlin (Federal Environment Institute): e.g. „Specific Energy Figures", Cumulated Energy Demand http://www.oeko.de/service/kea and "Guidelines for Energy Management in Companies" (ISSN 0722-186X); Guidelines of VDI – Verein Deutscher Ingenieure (Federation of German Engineers) e.g. VDI 3922 (http://www.vdi.de)
Ireland	Yes	The EPA has not developed any guidance notes for the efficient use of energy. However the Irish Energy Centre, a body specially set up to deal with Energy management issues in Ireland offer guidance to industry on this issue. Their web site address is as follows - http://www.irish-energy.ie
Italy		There are some guidance or technical rule prepared by CNR, ENEA, ANPA (ANPA – Strategies and measures for reducing greenhouses gases emissions through efficiency in final use of electrical energy) (See Annex).
Lithuania	No	
The Netherlands	Yes	Support by the national advisory body for energy saving (NOVEM) for the MJA-members. Technical information sheets for general use.
Poland	No	
Portugal	Yes	Definition of minimum efficiency requirements for hot water boilers; Definition of energy consumption optimums for some industry sectors (Food and Drinks, Textiles, Wood and Cork, Pulp and Paper, Chemistry and Cement, Ceramics and Glass) under the Decree-Law no. 58/82 of 26 February 1982 (RGCE); Definition of adequate values for energy consumption in buildings considering energy efficiency, under the Regulation of the Thermal Characteristics of the Thermal Behaviour of Buildings (RCCTE) (DL 40/90 of February 6th); Guidelines on Energy Auditing in Textiles, Ceramics, Dairies and Wood and Cork Sector (prepared by Centre for Energy Conservation in 1998).
Sweden	No	
The United Kingdom	Yes	Non-statutory guidance on general energy efficiency and by industrial sector is provided by regulators.

Comments:
France: A guidance for combustion plants is provided by the ministry of economy finance and industry. There is sector-wise guidance about efficient use of energy issued by ADEME.

1.3 Implementation in practice

1.3.1 Is the obligation to use energy efficiently also applied to or will it be applied to other installations than those mentioned in the IPPC directive Annex I?

Table 10	Yes or no	Please, specify which types of installations:
Austria	No	Not yet.
Denmark	Yes	In principle, all installations are obliged to use energy efficiently. The incentive to do so is coming from the taxation of energy and CO2 and grants for energy saving projects.

		Installations mentioned in Annex 1 (in total 6 500 off which 1200 are IPPC installations) to the statutory order from the Ministry of Environment and Energy no. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000, have special requirements, see section 3.2. below.
Finland	No	The general understanding is that the obligation will at least be applied to IPPC plants, however, the permitting authority has the freedom to consider energy efficiency also on a smaller scale.
France	Yes	All installations that have an environmental permit. They are more numerous than IPPC installations.
Germany	Yes	See attached list (translation can be provided if necessary)
Ireland	No	Installations other than IPC and IPPC installations are not enforced by the Irish EPA.
Italy	Yes, in principle.	Italian laws regarding energy efficiency refer to installations other than those covered by IPPC (for example services, goods production) and also to installations within the categories of Annex 1 of IPPC (without any production level threshold.).
Lithuania	Yes	There is the same obligation to use energy efficiently to other installations, than those mentioned in the IPPC Directive Annex I. This obligation is applied both for the installations, mentioned in Annex I, and for other installations, it is transposed from Directive Article 3 (d). Exact wording is such: "Common provisions to grant permits: 8.4. Nature recourses, including water, should be used economically, energy should be used effectively. For this purpose the cycle of use of materials and raw materials should be monitored and controlled". The criteria for permitting for "other" installations are: Abstraction of water from environment (underground water, surface water), more than 10 m^3 per day; Waste water discharge to environment, more than 5 m^3 per day; Collection of storm water from territories more than 10 hectares; Pollutants emissions to atmosphere, more than 10 t per year; Emission of hazardous pollutants to the air (I and II class of toxicity); Waste incineration, including used oils, waste disposal and use; Generation of hazardous waste, more than 50 kg/monthly average; Generation of non hazardous waste, more than 1000 kg/monthly average; Etc.
The Netherlands	Yes	Various smaller installations like shops, offices, greenhouses etc.
Poland	Yes	All the types of installations
Portugal	Yes	All installations that are considered to be energy intensive consumers according to Decree-Law 58/72 of 26th February and Decree (Portaria) 359/82 of 7th April, namely those with: - energetic consumption bigger than 1 000 TOE/year (Tonnes of Oil Equivalent) - total equipment nominal consumption bigger than 0,5 TOE/hour - the nominal consumption of a single equipment exceeds 0,3 TOE/hour
Sweden	Yes	All types of human activity are covered by the Code.
The United Kingdom	No	

Comments:
Germany: Annex to 1.3.1:
Installations which require the permit in regard of the Federal Immission Control Law but are not listed in Annex I of the IPPC directive.

Anlagenart	***Ziffer der 4. BimSchV***
Feuerungsanlagen 0,1 bis 50 MW (je nach Brennstoffart)	Ziffer 1.2 Spalte 2 und 1.3
Verbrennungsmotorenanlagen	Ziffer 1.4
Gasturbinen für Arbeitsmaschinenantrieb	Ziffer 1.5
Säurepolieren und Ätzen von Glas mit HF	Ziffer 2.9
Verschmelzen von Stahl mit weniger als 2,5 t pro Stunde	Ziffer 3.2
Herstellung und Reparatur von metallischen Schiffskörpern	Ziffer 3.18
Bau von Schienenfahrzeugen	Ziffer 3.19
Bau von Kraftfahrzeugen	Ziffer 3.24
Bau von Luftfahrzeugen	Ziffer 3.25
Malen, Mischen und Abbacken von Pflanzenschutzmittel	Ziffer 4.2
Destillation zur Aufarbeitung von organischen Lösungsmitteln	Ziffer 4.8
Herstellung von Anstrichstoffen	Ziffer 4.10
Tränken und Überziehen von Stoffen unter Verwendung organischer Lösungsmittel mit einem Verbrauch von 25-150 kg pro Stunde	Ziffer 5.4

Holzspan- und Holzfaserplatten	Ziffer 6.3
Tierintensivhaltung, z. B. 1.500–2.000 Schweine; 560–750 Sauen; mehr als 250 Rinder; mehr als 1.000 Kälber; 15.000–40.000 Stück Geflügel,	Ziffer 7.1
Tierkörperbeseitungsanlagen für weniger als 10 t pro Tag	Ziffer 7.12
Brauereien mit weniger als 300 t pro Tag	Ziffer 7.27
Abfallbehandlungsanlagen zwischen 1 und 20 bzw. 50 t pro Tag, je nach Abfallart	Ziffer 8.11
Anlagen zur Wiedergewinnung von Sprengstoffen	Ziffer 10.1 Spalte 2
Anlagen zur Herstellung von Zellhorn und Zellulosenitrat	Ziffer 10.2 und 10.3
Anlagen zum Vulkanisieren von Kautschuk	Ziffer 10.7
Anlagen zum Bleichen oder zum Färben von Textilien mit 2-10 t pro Tag	Ziffer 10.10
Anlagen zur Textilveredelung	Ziffer 10.23
Kälteanlagen	Ziffer 10.25

1.3.2 How much of the total industry energy use do these installations cover?

Table 11	IPPC installations, (average ….%)	Other installations, (average ….%)	Please specify:
Austria	Total energy end-use (IPPC and other installations) 276 PJ		The data are based on statistics from 1998 (the IPPC-directive was not implemented at that time), so we had no data about the number of IPPC installations. For the next year we can calculate the average for IPPC and other installations.
Denmark			NO ANSWER
Finland	80–85 %	< 2 %	
France			In 1999, industry represented 49,4 Mtoe (millions of tons oil equivalent) without energy production sector. No detailed cross-study of IPPC installation and energy use was yet conducted at national level. But from national statistics on energy use, siderurgy and first steel transform (10 490), organic chemistry industry (6 902), mineral chemistry industry (5 251), paper industry (3 479), ceramics and construction materials (3 267), production of non ferrous metals (2 793), glass industry (1 879) and automobile industry (1 197) account for 70 % of brut energy consumption in industry. Industry represents about 20 % of total French energy consumption. Energy sector represents about 10 % of total French energy consumption. Thus, industry and energy sector account for 30 % of total energy consumption in France (precisely 32,2 % in year 2000).
Germany			No figures available at the moment. The other (not IPPC) installations are in general smaller ones without big energy consumption.
Ireland	-	-	
Italy	72,7 %	27,3 %	Approximate data are reported due to the share given to some category of installations and to the threshold of production that excludes some IPPC installations. Data refer to year 1995.
Lithuania	About 65 %	About 35 %	
The Netherlands	80 %	20 %	This question is very difficult to answer. I am particularly confused by the word "average". If you want a rough indication of the percentage IPPC vs. others I would guess 80 % vs. 20 % of total industry energy.
Poland	-	-	We don't have such information at the moment.
Portugal	-	-	Not known.
Sweden	85 %	15 %	For electricity about 80 %, while for fuels and heat about 90 %.
The United Kingdom	82 %	18 %	1998 estimates, excluding power generation

1.3.3 Are there, or will there be, differences in energy efficiency requirements between the existing and new IPPC installations?

Table 12	Yes or no	Please specify
Austria	No	The requirements in permits for existing installations that have been substantially changed and new installations will be the same. Note the transition period for existing

		installations (31st October 2007).
Denmark	Yes	New installations must comply with BAT. Existing installations have according to Danish law a legal protection for 8 years from the date of the first permit. After this period the principle of proportionality applies.
Finland	No	At this time, no requirements need to be applied. Considered case by case.
France	Yes	The consideration on energy efficiency are now a full part of the permit procedure. The existing IPPC are bound to level with the new ones: energy efficiency will be studied in the permitting process and the reference to best available technology is compulsory in the revision of environmental permits.
Germany	Yes	It is a general principle of German administration law, that for legally existing installations costs and advantages for new legal requirements have to be balanced carefully and a shutdown caused by the new condition has to be avoided. In addition, the measures must be technically and practically possible in that given special structure of the installation. The method to implement new techniques is therefore in the most cases to set an individual or branch-wise time frame for a transitional period by law or ministerial decision or general administrational regulation or individual regulation by .the competent authority.
Ireland	Yes	Many existing facilities operate older equipment that is not as efficient as the current day equivalent. These facilities often operate on tight margins so in some cases they find it difficult to obtain capital investment to upgrade to a modern system, despite the fact that it will actually save them money in the long term. In most cases new installations are designed with a point of view towards reducing energy costs and therefore capital investment is more readily available.
Italy	No, in principle	The main difference is the time available for existing plant to adopt BAT.
Lithuania	No	Requirements for energy efficiency for existing installations will be implemented later than in new ones.
The Netherlands		The requirement are the same, the moment of implementation can differ.
Poland	Yes	Environmental Protection Law, art. 143: "Technology applied in newly set up or essentially altered installations and facilities should comply with requirements which setting out is driven in particular by: (...) 3) effective energy generation and consumption". Requirements for application and permits content are the same.
Portugal	Yes	The level of demand is likely to be higher for new installations (similarly to the philosophy of the BAT definition in the BREFs, e.g. for clinker and lime production). Permits based on environmental performance to be achieved by BAT that are set differently for new and existing will therefore reflect these differences. Furthermore, for existing installations, costs and advantages for new legal requirements regarding this aspect will have to be balanced in order to avoid shutdowns.
Sweden	No	Not as a general rule. In practice, however, new installations are likely to find requirements on energy efficiency easier to fulfil than would older installations.
The United Kingdom	Yes	Only to the extent that there are always differences in requirements between new and existing installations.

1.3.4 Is there a transitional period for the existing IPPC installations to achieve the general requirements of energy efficiency?

Table 13	Yes or no	Please specify
Austria	Yes	The transitional period is the same as in the Directive (e.g. Section 81c of the Trade and Industry Act): 31st October 2007.
Denmark	No	We have no general requirements of energy efficiency, see also 1.3.3.
Finland	No	Nothing is defined.
France	Yes	A decree (décret du 21 sept. 77 modifié) and a ministry decision (arrêté du 17 juillet 2000) gave IPPC installation a transitional period.
Germany	Yes	See 1.3.3. In general, the existing installations have to meet the requirements in the year 2007.
Ireland	Yes	As soon as the IPPC directive is introduced to Irish Law the existing installations will be reviewed sector by sector between 2002 and 2007, so in effect there will be a five year transitional period.
Italy	Yes	Existing plants already meet requirements of current energy laws. If additional requirements will be issued by integrated Permits (as defined by IPPC Directive), existing plants will comply before October 2007.
Lithuania	Yes	According to the Directive.

The Netherlands	Yes	
Poland	-	Transitional period refer to the following types of installations which may achieve integrated permit after 2007: municipal heat sources with a rated thermal input between 50 and 300 MW and municipal waste landfills receiving 10 to 20 tonnes per day) and those larger installations failing to meet all the requirements of the IPPC Directive that will successfully pass the procedure for adopting compliance programmes will be able to obtain integrated permits. Transitional period doesn't refer in particular to energy efficiency requirements.
Portugal	No	At the moment we have no general requirements of energy efficiency. However all the installations will have to have the environmental permit by October 2007.
Sweden	Yes & no	There is no transitional period apart from the one provided for in the IPPC Directive.
The United Kingdom	Yes	Transitional periods will be specified in permits.

1.3.5 If you have general binding rules (Article 9 (8) of the IPPC directive) do they apply to

Table 14	All installations	Industrial branches	Categories of installations	Specific pollutants	Please, specify:
Austria	No	No	Yes	No	Till today we have no binding rules relating specifically to efficient use of energy (but there are ordinances based on the Trade and Industry Act, the Waste Management Act and the Water Act).
Denmark	No	No	No	No	
Finland	No	No	No	No	No binding rules
France	Yes (arrête du 2 février 1998)	Yes (glass industry, cement industry,..)	Yes (Large Combustion Plant, installation for the incineration of waste, activities emitting VOC)	Yes (Ammonia,…)	As specified above, here, general binding rules should be understood as a binding guidance on environmental permits. The ministry decision (arrêté du 2 février 1998) applies to all plants excepts for combustion plants, quarries, cement industry, paper industry, glass industry, surface treatment, installation for the incineration of waste, whose cases are treated apart in separate ministry decisions. There are too ministry decisions giving prescriptions for specific pollutants.
Germany	No	No	No	No	There are no plans at the moment for general binding rules. Before IPPC existing GBR refer to waste incineration plants and to steel mills.
Ireland					Not applicable.
Italy					No GBR have been issued according to Art. 9(8) of IPPC Directive (See 1.1.6)
Lithuania	No	No	No	No	We have no general binding rules for branches of industry yet.
The Netherlands	No	No	Yes	No	See 1.1.7
Poland	No	No	No	No	No general binding rules.
Portugal	No	No	No	No	We have no general binding rules.
Sweden	No	No	Yes	No	Currently, there are no general binding rules for IPPC-installations. However, such rules exist for some other industrial installations.
The United Kingdom	No	No	No	No	Consideration of GBRs is taking place for certain industry sectors and possibly for energy efficiency provisions.

1.3.6 What is or would be the main content of the general binding rules?

Table 15	Clarification (determination) of energy consumption	Energy analysis	Energy inspection	Plan for making energy savings more effective	Energy savings measures	Reporting	Other	Please, specify:
Austria	No	No	Yes	No	No	No	No	No horizontal regulations for efficient use of energy planned (for the Trade and Industry Act).
Denmark	No	No	No	No	No	No	No	
Finland	Yes	Yes	No	Yes	Yes	Yes	No	Included above, are only indications of what obligations are included in the voluntary energy saving agreements
France	Yes	Yes	No	Yes	Yes	Yes	No	The ministry decisions demands elements on efficiency energy use: clarification of energy consumption and justification of energetic choice. Apart from ministry decision, operator have to report on fuel consumption every year.
Germany	Yes	Yes	No	Yes	Yes	Yes	No	The underlined items are most probably chosen, eventually some energy saving measures too.
Ireland								Not applicable.
Italy								See 1.3.5. Recent IMPEL report tries to define possible contents of GBR.
Lithuania								See answer in 1.3.5.
The Netherlands	Yes	Yes	Yes	Yes (larger consumers)	Yes	Yes	Energy performance for buildings	
Poland	No	No	No	No	No	No	No	
Portugal	No	No	No	No	No	No	No	Not applicable (no general binding rules).
Sweden								All of the above given alternatives are likely to be considered.
The United Kingdom	No	No	No	No	No	No	No	Not known

1.3.7 Can the environmental permit authority deviate (in any direction) from the provisions of the general binding rules on energy efficiency?

Table 16	Yes or no	Please, specify in which direction:
Austria	-	
Denmark	-	
Finland		If there would be generally binding rules, they would also bind the authorities.
France	No	The ministry decision apply even if the environmental permit has not been up-dated. Still, according to local conditions, environmental permit can be stricter than ministry decision.
Germany	Yes	Due to German general administrational law, an authority can only deviate if it is evident, that the state of technology/BAT has developed considerably to a higher level.
Ireland		Not applicable.
Italy	No	See 1.3.5. In principle no, because GBR will be issued (if any) at State level.
Lithuania		See answer in 1.3.5.
The Netherlands	Yes	If they have good reasons.
Poland	-	There are no general binding rules.
Portugal	Yes	This is not defined yet, but possibly general binding rules are minimum requirements and the permits can be more strict.
Sweden	Yes	Existing general binding rules are minimum requirements. Thus, the permit/supervisory authority can impose stricter requirements.
The United Kingdom	-	Not known.

2 THE AUTHORITIES AND ORGANISATIONS

2.1 The competent authorities and organisations

2.1.1 Which ministry/authority is responsible for the national policy on energy?

Table 17	
Austria	Federal Ministry of Economic Affairs and Labour.
Denmark	The Energy Agency (formerly a part of the Ministry of Environment and Energy, now a part of the Ministry of Industry and Economy).
Finland	Ministry of Trade and Industry.
France	The ministry of economy, finance and industry is responsible for the definition of national policy on energy and its enforcement. Part of the energy administration is at the disposal of the ministry of environment as the ministry of environment is associated to the definition and enforcement of rational use of energy.
Germany	Federal Ministry for Economy (BMWi).
Ireland	Department of Environment, Department of Public Enterprise.
Italy	At national level the Ministry of industry is responsible for the definition of the targets and guidelines. The energy plan is defined at regional level.
Lithuania	Ministry of Economics.
The Netherlands	The Ministry of Economic Affairs.
Poland	Ministry of Economy.
Portugal	Economical Affairs Ministry/General Directorate of Energy.
Sweden	At the ministry level, responsibility is shared between the Ministry for the Environment and the Ministry of Industry. At authority level, there is the Swedish National Energy Administration, but all authorities must take energy aspects into consideration as appropriate.
The United Kingdom	Department of Trade and Industry.

2.1.2 Is this ministry/authority also responsible for environmental issues?

Table 18	Yes or no	Please specify
Austria	Yes	Partially (Trade and Industry Act covers commercial installations).
Denmark	No	

Finland	No	
France	No	The ministry of economy, finance and industry is not responsible for environmental issues. The ministry of spatial planning and the environment is responsible for environmental issues.
Germany	No	Federal Ministry for the Environment (BMU)
Ireland	Yes	Department of the Environment
Italy	No	The Ministry of industry agrees with ministry of environment for environmental issues.
Lithuania	No	
The Netherlands		This is a joined responsibility of the Ministry of Economic Affairs and the Ministry of Housing, Spatial Planning and the Environment (VROM).
Poland	No	Ministry of Environment is responsible for environmental issues.
Portugal	No	
Sweden		At the ministry level, the main responsibility lies with the Ministry for the Environment. At authority level, there is the Swedish Environmental Protection Agency, but all authorities must take environmental aspects into consideration as appropriate.
The United Kingdom	No	

2.1.3 Which ministry/authority is competent for giving guidance on energy efficiency in environmental permits?

Table 19	
Austria	Federal Ministry of Economic Affairs and Labour (Trade and Industry Act, Mining Code); Federal Ministry of Agriculture and Forestry, Environment and Water Management (Waste Management Act, Water Act).
Denmark	The Danish EPA is responsible for making guidelines concerning environmental permits. The Danish Energy Agency gives guidance to the companies. This guidance is seldom used in the permitting process.
Finland	Ministry of the Environment.
France	The Ministry of Land Use Planning and the Environment is competent for giving guidance in environmental permits.
Germany	Federal Ministry for the Environment. So far as they don't give guidance the Länder can give guidance themselves.
Ireland	EPA once IPPC comes into legislation and the Irish Energy Centre a public body, which will operate as a statutory body under the Department of Public Enterprise from 2002. This body is currently funded by the EU under the Occupational Programme for Economic Infrastructure.
Italy	Ministry of environment in agreement with ministry of industry.
Lithuania	Ministry of Environment (Regional Environmental Protection Departments).
The Netherlands	This is a joined responsibility of the Ministry of Economic Affairs and the Ministry of Housing, Spatial Planning and the Environment (VROM).
Poland	There are no such guidance.
Portugal	Environmental and Land Planning Ministry in co-ordination with the General Directorate of Energy.
Sweden	The Swedish Environmental Protection Agency is competent to give such guidance, but permit authorities, i.e. the regional Environmental Courts and the county administrative boards, are not bound by it.
The United Kingdom	Department of the Environment, Food and Rural Affairs and the Environmental Regulators

2.1.4 Which authorities are competent for issuing permits including energy efficiency?

Table 20	National/Federal level:	Province/"Länder" level:	Regional level:	Local level:
Austria	Federal Ministry for Economics and Labour (for Mining Code)	Independent administrative tribunal (for appeals); provincial government (for EIA); provincial governor (for Waste Management Act)	Municipality/district authority	-
Denmark	The Danish Environmental Protection Agency	-	The Counties (the County Councils of which DK has 14).	The municipalities (the Municipal Councils of which DK has 275).
Finland	-	Environmental Permit Authorities	Regional Environment Centres	-
France	-	Does not exist in France.	Department level: The representative of the government (Préfet) issues environmental permits after a public consultation was conducted.	The local representative of national environment inspectorate study the documents provided.
Germany	-	-	Mostly that are Staatliche Umweltämter, Bezirksregierungen /Regierungspräsidien (reporting to the Länder ministry), or Landratsämter, so the organisation of the permitting system is different in the various Länder.	-
Ireland	Irish EPA & Irish Energy Centre (agreements on a voluntary basis).	Not applicable	Not applicable	Local Authorities (County Councils)
Italy	Ministry of Environment for installations of national significance (as far as IPPC permit is concerned).	-	Regional Authorities for installations of regional significance (as far as IPPC permit is concerned).	-
Lithuania	Regional Environmental Protection Departments (REPD).	Regional Environmental Protection Departments (REPD)	Regional Environmental Protection Departments (REPD)	Regional Environmental Protection Departments (REPD)
The Netherlands	The State	Provincies	-	Municipalities
Poland	-	Voivod	Starost	-
Portugal	General Directorate of Energy, regarding DL 58/82 of 26th February.	-	-	-
Sweden	See below.	See below.	See below.	See below.
The United Kingdom				Environment Agency, Scottish Environmental Protection Agency, Environment and Heritage Service (NI)

Comments:

France:

The legislation comes from the environment code and the decree (décret n°77-1133 du 21 septembre 1977).

Sweden:

Major installations, a concept which comprises most of the IPPC installations, obtain permits from five regional Environmental Courts whereas the rest of the IPPC installations and other medium sized installations obtain theirs from the 21 county administrative boards.

2.1.5 Which authorities/organisations are responsible for monitoring compliance with energy efficiency conditions?

Table 21	National/Federal level:	Province/"Länder" level:	Regional level:	Local level:
Austria	Federal Ministry for Economics and Labour (for Mining Code)	Provincial governor (for Waste Management Act)	Municipality/district authority	-
Denmark	The Danish Energy Agency when an agreement is made. In other cases it is the environmental authorities, see 2.1.4.	-	-	-
Finland	Energy Information Centre for Energy Efficiency and Renewable Energy Sources Motiva (voluntary agreements).	-	Regional Environment Centres	-
France	Ministry of Land Use Planning and the Environment and Ministry of Industry.	-	Direction Régionale de l'Industrie de la Recherche et de l'Environnement under the responsibility of the representative of the government (préfet).	-
Germany	-	-	Yes	-
Ireland	Irish Energy Centre, Irish EPA and the Electrical Supply Board.	-	-	Local Authorities (County Councils)
Italy	As far as the Integrated Permit is concerned, compliance is ensured by national and regional environment agencies.			
Lithuania	REPD (for all conditions of permits)	REPD (for all conditions of permits)	REPD (for all conditions of permits)	REPD (for all conditions of permits)
The Netherlands	Ministry of Economic Affairs (MJA-schemes), supported by branch organisations and NOVEM.	Provincies (permits)	-	Municipalities (permits)
Poland	-	Yes	Yes	-
Portugal	General Directorate of Energy, regarding DL 58/82 of 26th February.			
Sweden	See below.	See below.	See below.	See below.
The United Kingdom				Environment Agency, Scottish Environmental Protection Agency, Environment and Heritage Service (NI)

Poland: Chief Inspectorate for Environmental Protection is the competent authority for inspection and monitoring in Poland. The tasks at province and regional level are implemented by Voivodship Inspectorates for Environmental Protection.

Sweden: The county administrative boards carry out the monitoring of compliance of all types of conditions in permits for almost all IPPC installations. However, such monitoring is mainly based on data from self-monitoring.

2.1.6 Which authorities/organisations are competent to enforce energy use and efficiency?

Table 22	
Austria	National/Federal level: Federal Minister for Economics and Labour (for Mining Code) Province/"Länder" level: Provincial governor (for Waste Management Act) Regional level: Municipalities/district authorities.
Denmark	The Ministry of Environment and the Ministry of Industry and Economy (the Energy Agency).
Finland	Environmental Permit Authorities, The Ministry of Trade and Industry (voluntary agreements).
France	According to the decree quoted above, the energy authority is competent to enforce energy use and the environment authorities are associated to the energy authorities to enforce energy efficiency.
Germany	In most of the German Länder the Staatliche Umweltämter as regional authorities reporting to the Länder-Ministry for the Environment, in a few Länder the general local authorities („Kreise").
Ireland	All of the above in 2.1.5.
Italy	Competent authorities as in 2.1.4.
Lithuania	REPD (in frame of requirements on energy use reflected in permit only).
The Netherlands	Same as 2.1.5.
Poland	Ministry of Economy, Energy Regulatory Office, Ministry of Environment (in relation to environmental issues).
Portugal	General Directorate of Energy.
Sweden	See comment below.
The United Kingdom	Environment Agency, Scottish Environmental Protection Agency, Environment and Heritage Service (NI).

Comment:
Sweden: As we understand it, enforcement consists of at least two parts. First, the supervisory authority may order the operator to take compliance measures. Second, e.g. non-compliance with permit conditions is a criminal offence and in such cases the supervisory authority will notify the public prosecutor, who will then decide whether or not to prosecute. Of course, a combination of these two parts is possible (or even likely). Moreover, the Swedish Environmental Protection Agency and a number of other authorities may participate in permit procedures and request the permit authority to require measures for e.g. the efficient use of energy from the applicant.

2.2 Co-operation between authorities/organisations

2.2.1 Which organisations are involved in energy efficiency issues in your country?

Table 23	Please, specify in which way they are involved:
Austria	Federal Ministry for Economics and Labour, Federal Ministry of Agriculture and Forestry, Environment and Water Management, Federal Environment Agency Ltd.
Denmark	A wide spectre of organisations, including all industrial organisations, the energy producing sector, the consumers and the Government are involved. The outcome of the involvement is guidelines on energy saving.
Finland	Ministry of Trade and Industry: Energy Efficiency Action Plan; state grants for certain energy efficiency investments, including energy audits; energy efficiency minimum standards (EU-directives). Ministry of the Environment: building code including energy efficiency issues, environmental permits. Energy Information Centre for Energy Efficiency and Renewable Energy Sources (Motiva), Finnish Standards Association SFS (labelling), NGOs (industry, The Finnish Association for Nature Conservation etc.), Municipalities (e.g. Agenda21), Helsinki Metropolitan Area Council (YTV).
France	Ministry of Land Use Planning and Environment, Ministry of Economy Finance and Industry, ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie).
Germany	BMU: (see 2.1.3). BMWi: Steering energy issues in general by means of energy taxes, promoting and funding of investments and research in special energy installations e.g. windmills or fixing special fees for (electrical) energy generated e.g. by windmills. Länder-Ministries for Environment: Issuing administrational regulations and advice for their competent authorities how to manage the federal laws and decrees. Länder-Ministries for Economy: Promoting and funding of investments and research in special energy installations e.g. windmills. Umweltbundesamt (UBA-Federal environment institute, Berlin): Providing information; help the Federal Ministry for the Environment (BMU) to give guidance;

	Länder-Umweltämter (LUA-Länder environment institutes): Providing information to the Staatliche Umweltämter; Staatliche Umweltämter etc. (see 2.1.6).
Ireland	Irish Energy Centre, Irish EPA, and the Electrical Supply Board, Local Authorities. Irish Energy Centre – Operate a Voluntary agreement system for Energy efficiency. EPA & Local Authorities – Legislative involvement.
Italy	National Environmental Agency – ANPA (as technical support for Ministry of environment). National Organisation for new technologies, energy and environment – ENEA (as technical support for Ministry of Industry and occasionally for Ministry of Environment).
Lithuania	Energy efficiency fund.
The Netherlands	Besides the authorities there are: - Branch organisations, involved in negotiations about voluntary agreements and involved in monitoring performance; - The national institute for energy saving (NOVEM), advising companies about the voluntary agreements; - Special bodies like the benchmarking authority (an independent body, controlled by a committee with representatives of the authorities and the industry), supervising the benchmarking process (see also 1.1.7).
Poland	See 2.1.6.
Portugal	- Ministry of Environment and Land Planning / Environment Institute – developing the Climate Change National Strategy, with energy efficiency targets for various consumers; attribute IPPC permits including energy efficiency; - Ministry of Economy/General Directorate for Energy – development and implementation of several policy instruments to promote energy efficiency (minimum standards, labelling, regulation, energy efficiency grants; - AGEEN – National Energy Agency and Municipal energy agencies – develop guidelines for the efficient use of energy, communication and promotion of the efficient use of energy; - Regulator of the Electric Sector – ERSE – creation of incentive for DSM through the electricity tariff formula; - Electricity Producers – implementation of DSM (Demand Side Management) programmes (not very relevant up to the moment); - Industrial organisation and technical centres – provide guidance on energy efficiency; - NGOs – communicate the relevance of energy efficiency – increase consumer's awareness.
Sweden	Industrial organisations by participating in permit procedures and by taking own initiatives.
The United Kingdom	For industry only: National Government is responsible for non-regulatory energy efficiency mechanisms such as energy taxation, emissions trading and voluntary agreements. National Government is also responsible for provision of energy efficiency best practice advice, including industrial sectors.

2.2.2 Is there co-operation between environmental authorities, energy authorities and other organisations in the implementation and guidance on energy efficiency in the permit procedure?

Table 24	Yes or no	Please, specify what kind of co-operation?
Austria	Yes	See for example Sec. 356b Trade and Industry Act e.g. (concentrated permitting procedure managed by the "Gewerbebehörde" = local authority). Co-ordination e.g. with the nature protection authority. See also Section 121 of the Mining Code.
Denmark	No	
Finland	Yes	Between the Ministry of the Environment (MoE) and the Ministry of Trade and Industry (MTI). MoE, The Confederation of Finnish Industry and Employers (TT), the Regional Environment Centres and Energy Information Centre for Energy Efficiency and Renewable Energy Sources (Motiva) has organised joint seminars for regional and local authorities and industrial stakeholders, including presentation by MTI on energy efficiency. MTI has participated in guidance workshops for regional authorities arranged by MoE, having presentation on energy efficiency.
France	Yes	At national level, environment authority consults the energy authority when elaborating the legislation. The two ministries share local representatives within regional direction of research, industry and environment (DRIRE). These local representatives belong to the local commissions of ADEME that grant financial support for the industry.
Germany	No	
Ireland	Yes	The EPA and Irish Energy Centre co-operate closely on this issue. The Irish Energy Centre also works very closely with Local Authorities and Industrial organisations such as IBEC (Irish Business and Employers Confederation).
Italy	Yes	Normally they co-operate in working groups.

Lithuania	No	
The Netherlands	No	In general not for individual permit procedures.
Poland	No	
Portugal	No	Not at the moment, but possibly some changes will occur.
Sweden	Yes	The Energy Administration and the EPA have an on-going dialogue on energy efficiency issues and also certain projects in common.
The United Kingdom	Yes	The government and regulating authorities co-operate in establishing compatibility between regulatory and non-regulatory energy efficiency schemes to meet the requirements of IPPC. Consultation also takes place between regulating agencies and government, or government-appointed bodies, in development of energy efficiency guidance to industry.

2.2.3 Is there co-operation between environmental authorities, energy authorities and other organisations in the monitoring of energy use and its efficiency in the permit procedure?

Table 25	Yes or no	Please, specify what kind of co-operation and between whom?
Austria	Yes	See 2.2.2
Denmark	No	
Finland	Yes	Between the MoE and the MTI. There was a joint venture project MTI/MoE/FEI/industry to determine monitoring system suitable both VAs (Voluntary Agreements) and Environmental Permits (IPPC).
France	Yes	The local representatives of energy authority and environment authority are under the same regional director (DRIRE), that depends upon the Ministry of Environment and the Ministry of Industry.
Germany	No	
Ireland	No	
Italy	Yes	Only information exchange.
Lithuania	No	
The Netherlands	Yes	Authorities are informed by the NOVEM (see 2.2.2) if companies do not perform adequately.
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom	Yes	Where non-regulatory energy efficiency schemes are used as part of the permit requirements for IPPC, these are monitored by government.

2.2.4 Is there co-operation between environmental authorities, energy authorities and other organisations in the enforcement of energy use and efficiency in the permit procedure?

Table 26	Yes or no	Please, specify what kind of co-operation?
Austria	Yes	See 2.2.2
Denmark	No	
Finland	Yes	When drafting a guidebook for energy efficiency in environmental permit produced by Ministry of the Environment, there was a steering group from MoE/MTI/ The Confederation of Finnish Industry and Employers (TT)/regional authorities guiding the work. They also participated in drafting the permit application form for energy efficiency details.
France	Yes	The local representatives of energy authority and environment authority are under the same regional director (DRIRE).
Germany	No	Energy authorities in Germany are competent only for economic issues
Ireland	No	
Italy	Yes	Only information exchange.
Lithuania	No	
The Netherlands	Yes	Same as 2.2.3. Authorities will then start a procedure to enforce or adapt the permit.
Poland	No	
Portugal	No	
Sweden	Yes	
The United Kingdom	Yes	Where the conditions of non-regulatory energy efficiency schemes are not met by a permit-holder to the satisfaction of the government, the regulating authorities are notified and enforcement action may result.

Comments:
Sweden: As mentioned above, the Swedish Environmental Protection Agency, the county administrative boards and some other authorities may appear as parties to the proceedings. In such cases, there is often co-operation between the "state parties". Moreover, the permit authority may request the opinion of other authorities, such as the Energy Administration.

3 ENERGY EFFICIENCY IN THE PERMIT PROCEDURE

3.1 Guidance for the applicant

3.1.1 Is there any national guidance provided to the applicant in order to evaluate energy efficiency of the operation/activity? If yes, what kind of guidance?

Table 27	No national guidance	Official documents (guide)	Application forms	Negotiation between the applicant and the competent authority	Other, e.g. sector-wise	Please, specify:
Austria	x	-	-	-	-	
Denmark	-	-	-	-	x	Sector energy analysis and some horizontal guidelines.
Finland	-	x	x	x	-	Motiva's activities and financial support for analysis; Energia-Ekono's report 1999.
France	-	-	-	x	-	There is binding guidance about energy efficiency but it does not provide quantified objectives. There are documents from ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie) that provide sector-wise information about energy efficiency, energy efficient technology. Information about voluntary energy saving agreements or emission reduction are made available for the local representatives of the environment authority.
Germany	-	x [1) 2)]	-	-	x [3) 4)]	[1)] Leitfaden für das betriebliche Energiemanagement (Guidelines for energy management in companies UBA Texte 44/97 ISSN 0722-186X) including Guidelines for the applicant on the Pinch Point Analysis for improvement of energy efficiency by Linnhoff March Ltd., Northwich GB for UBA [2)] KEA (UBA 1999, see 1.2.2) [3)] Praxisleitfaden zur Förderung der rationellen Energieverwendungin der Industrie (Practical guidelines for the improvement of rational energy use in the industry – VIK-Verband der Industriellen Energie- und Kraftwerkswirtschaft, Essen, Germany ISBN 3-933826-00-4) [4)] Guidelines of VDI – Verein Deutscher Ingenieure (Federation of German Engineers) e.g. VDI 392 (http://www.vdi.de) as a source of information from a non-government-organisation.
Ireland	-	x	x	x	-	
Italy	x	-	-	-	-	No guidance is available for applicants at the moment. Some studies have been produced (ANPA, ENEA), but most of the guidance will be based on negotiation be-

						tween applicant and competent authority.
Lithuania						Requirements to use energy efficiently are set in permit rules, but not detailed how to evaluate energy use efficiency.
The Netherlands	-	x	x	x	x	E.g. AMVB's (binding rules). Larger (MJA) companies are also advised by NOVEM.
Poland	x	-	-	-	-	Application forms are under preparation.
Portugal	-	-	x	-	x	To apply for an environmental permit the applicant must fill an application form (Formulario) that has an immense number of questions including some relative to energy consumption and energy efficiency. Furthermore, the General Directorate of Energy and the Centre for Energy Conservation have developed several sector initiatives providing guidance of energy auditing (Textiles, Ceramics, Dairies and Wood and Cork), together with two training courses on the rational use of energy in industry (from 1998), as mentioned before (1.2.2).
Sweden	x	-	-	-	-	
The United Kingdom	-	x	-	x	x	General energy efficiency guidance is provided for IPPC installations by the regulators. In addition, sector-specific guidance (based on BREFs) provides further sector specific energy issues. Applicants use this guidance but may ultimately negotiate actual conditions with the competent authority.

3.1.2 What is the official status of the guidance?

Table 28	Binding or non-binding	Please, specify:
Austria	-	
Denmark	Non-binding	They are only guidelines for the industry.
Finland	Non-binding	
France	-	
Germany	Non-binding	
Ireland	Non-binding	
Italy	Non-binding	For example, a research project is in progress in ANPA aiming to issuing of guidelines for the evaluation of the potential of energy saving in industry using the method of "Pinch Analysis".
Lithuania	-	See 3.1.1.
The Netherlands	Binding and non-binding	AMVB's (binding rules), Others; authority can always decide otherwise, if motivated properly.
Poland	-	
Portugal	Binding and non-binding	The application form (Formulario) was published by Decree (Portaria) 1047/2001 of 1st September 2001 is binding, whereas the other guidance are solely intend to provide information on the theme.
Sweden	-	
The United Kingdom	Non-binding	

Comments:
Portugal: The application form (Formulario) is designed to contain general information about the installation and its activities and all the environmental information regarding its operation, maintenance and shutdown.
Sweden: If there would be guidance, it would be non-binding.

3.2 Application documents

3.2.1 What kind of information concerning energy use is the operator required to include in the application?

Table 29	Total energy balance	Energy production	Energy consumption	Assessment of energy efficiency	Energy saving plan	Earlier saving measures	Energy used for environmental protection measures	Description on energy use	Other	Please, specify:
Austria										Sec. 356a of the Trade and Industry Act requires (for IPPC installations) data on substances used or produced in the installation and on energy which leaves a certain discretion to the authorities (e.g. one authority holds the view that all mentioned areas except data on earlier saving measures are important to judge effective energy use).
Denmark	Yes	Yes	No	Yes	Yes	No	No	Yes	No	See statutory order from the Ministry of Environment and Energy no. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000. Annex 2, F18, F19 and G24.
Finland	No	Yes	Yes	Depends on the permitting authority	Depends on the permitting authority	Depends on the permitting authority	Depends on the permitting authority	Depends on the permitting authority	The report required by the MTI/ Motiva, if there is an agreement.	
France	Yes (input, output)	Yes (fuel used for the production of electricity or heat)	Yes (electricity or heat)	Yes (compared to BAT/ similar installations/ benchmarking)	Yes	Yes	No	Yes	No	

Germany	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Declaration of delivering usable off heat to third parties, if not used in the company itself; possibilities to achieve high usable energetic ratios and energetic optimisation, energy recovery, insulation measures.
Ireland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Italy	Yes	Yes	Yes	Yes	Yes	Yes	Included in the previous points.	Included in the previous points.	No	Discussions on this topic are ongoing. The ANPA Project mentioned at point 3.1.1 should help in defining the information required to the applicant.
Lithuania	Yes	Yes	Yes	Yes	No	No	No	Yes	No	
The Netherlands	Yes (input, output)	Yes (fuel used for the production of electricity or heat)	Yes (electricity or heat)	Yes (compared to BAT/ similar installations/ benchmarking)	Yes	Yes	Yes	Yes	No	All types of information is used, depending on the authority and the approach (see 1.1.7).
Poland	Yes	Yes	Yes	No	No	No	No	No	No	
Portugal	No	Yes	Yes	No	No	Yes	No	No	Yes	The operator is required to declare the energy consumption by product, and the quantification of CO_2 emissions.
Sweden	Yes	Yes	Yes	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	The three first are always included and the others may be required. “Other” could be how the use of fossil fuel can be reduced.
The United Kingdom	Yes	Yes	Yes	No	Yes	No	No	Yes	No	

3.2.2 What kind of additional monitoring information is required?

Table 30	Effects of measures for energy saving	Other	Please specify:
Austria	No	No	
Denmark	-	-	None.
Finland			
France	No	Yes	Effects of measures for rational use of energy and investments contributing to rational use of energy.
Germany	Yes	No	
Ireland	Yes	No	The activity may include the effects of the measures in the licence application but it is also addressed in the licensing permit condition quoted earlier.
Italy	Yes	No	Again no binding act is now in force.
Lithuania	No	Yes	Lithuanian companies are preparing waste reducing plans. In these plans energy saving issues are used too and these measures should be described in a detailed way.
The Netherlands	Yes	If the authority wants more.	
Poland	No	Yes	Proposed methods for monitoring of technological processes, including the measurement and registration of concentration or levels of substances or energy released to the environment.
Portugal	-	-	None
Sweden			Additional to what?
The United Kingdom	No	No	

3.2.3 Can information from the voluntary systems be used in the applications?

Table 31	Voluntary energy saving agreements	Voluntary environmental management schemes	Please, specify how the information is used:
Austria	Yes	Yes	
Denmark	Yes	Yes	To verify current effort and status.
Finland	Yes	Yes	Depends on the permitting authority.
France	Yes	No	
Germany	No	Yes	Information has to be concrete and detailed for the installation itself and has to be declared a part of the application documents. These requirements refer rarely to the voluntary energy saving agreements.
Ireland	Yes	Yes	The information is used in the application assessment. It is also used to set a bench mark against which the company will achieve various objectives and targets.
Italy	Yes	Yes	Applicant can refer to voluntary energy saving agreement or environmental management schemes without producing additional written information.
Lithuania	No	Yes	
The Netherlands	Yes	Yes	The energy plans made as part of the agreements are part of the application. Management scheme info is sometimes used as background material
Poland	-	-	There is no such an obligation in law.
Portugal	No	Yes	The operator is responsible for filling the permit so he can use whatever information he wants.
Sweden	(Yes)	(Yes)	Any relevant information can be used regardless of source.
The United Kingdom	Yes	Yes	Voluntary energy saving agreements may be used to meet part of the requirements for IPPC. In addition, each installation has to meet a set of basic energy requirements as a minimum. Environmental management systems may be used to demonstrate compliance with specific requirements.

3.2.4 Are there any differences between the requirements in the application documents for new and existing installations?

Table 32	Yes or no	Please, specify:
Austria	No	
Denmark	No	
Finland	No	
France	Yes	Compared to new installations, existing installations must provide a report on past years. The complete list of differences is available in the ministry decision. The main ones are: - an assessment of the effects of the plant on health and environment during past years; - an account of investments to prevent or reduce pollution during past years, the flux of pollutants towards water or air during past years.
Germany	Yes	Application documents for existing installations have to be sent in only in the case of planned substantial changes. They refer to the changed parts of the installations. The authority has to decide separately to the permit procedure, if there should be requirements to the unchanged parts. This would be the case if the installation does not meet achievable goals, then the authority issues an administrational order. For existing installations it is a matter of individual discussion if there would be documents necessary.
Ireland	Yes	New licences are now issued with an energy condition as quoted earlier. Existing IPC facilities will have to be reviewed once the IPPC directive is introduced to Irish Law.
Italy		No in the description part of the application. Differences can be anticipated as long as the updating of existing plants is concerned.
Lithuania	No	
The Netherlands	No	
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom	No	

Comments:
Austria: The permission procedure for a new installation and permission process for a installation with substantial changes (including the part of the existing installation) will be the same.

3.3 Permit consideration

3.3.1 How specific is the competent authority in terms of energy efficiency measures required in the permit?

Table 33	There are require-ments on energy use in the per-mit condi-tions (ex-amples)	There are references to the appli-cation	There are references to voluntary energy saving agreements	There are references to voluntary environ-mental manage-ment schemes (EMS)	Other	Please, specify:
Austria	No	No	No	No	No	
Denmark	No	Yes	No	No	No	
Finland	No	No	Yes	Yes	No	Most likely there will be refe rences.
France	No	Yes	No	No	No	In the application form, operator must provide information on energy use and energy efficiency as quoted in 3.2.1.
Germany	No	Yes	No	No	No	Permit conditions will be necessary, if the authority has to fix other or additional measures than those described in the application documents. In other cases the energy efficiency measures are usually determined by reference to the application documents.
Ireland	No	No	No	No	Yes	The current licence template has a condition that requires the activity to carry out a thorough energy audit which will identify all opportunities for energy use reduction and efficiency. This information is submitted to the EPA in an Annual Environmental Report (AER).
Italy						No single answer is possible. According to the devolution of jurisdiction towards the regions in force in Italy, each competent authority acts individually within the defini-tion of energy efficiency (see 1.2.1).
Lithuania	Yes	Yes	No	No	No	
The Nether-lands	No	No	Yes	Yes	Yes	See 1.1.7
Poland	Yes	No	No	No	No	Permit specify the condition for type and quantity of consumed energy, materials, raw-materials and fuels.
Portugal	No	No	No	No	Yes	In the permit, the operator is required to monitor its energy production and usage, and promote an annual self assessment of its energy efficiency. However the experience with permits issuing is still limited and it is likely that there might be some future changes.
Sweden						The experience is still very limited, but in principle all of the above alternatives can be used, e.g. a condition stating that “Not more than 5 GJ of heat may be used per tonne of product produced as an annual average”.
The United Kingdom	Yes	No	Yes	No	No	

3.3.2 What are the specific energy saving items that the authority takes into consideration when evaluating energy efficiency?

Table 34	Choice of fuel	Use of electric-ity	Use of heat	Process optimi-sation	Other technical measures	Index for energy effi-ciency or specific use of energy	Use of waste energy	Previous measures for en-ergy saving	Planned measures for en-ergy saving	Planned measures for envi-ron-mental invest-ments	Other	Please, specify:
Austria	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	
Denmark	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	See statutory order from the Ministry of Environment and Energy No. 807 of 25 October 1999 on permits for listed activi-ties and installations as last amended by statutory order no. 107 of 1 February 2000. Annex 2, F18, F19 and G24.
Finland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Thus far, there has not been much experi-ence and all alternatives seem to have some kind of relevance.
France	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	
Germany	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	If applicable: Considerations of co-generation of power and heat.
Ireland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	All of the above including any other pro-posals for the conservation of energy are evaluated in the Objectives and Targets set by the EPA and in the Annual Envi-ronmental Report submitted by the licen-see to the Irish EPA.
Italy												See previous point
Lithua-nia	Yes	No	No	Yes	No	No	Yes	No	Yes	No	No	
The Nether-lands	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes (e.g. pay-pack-period see 1.1.7)	

Poland	Yes	Yes	Yes	No	No	No	No	No	No	No	No	It's difficult to say at the moment (when new law is not in force yet) what other items the authority will take into consideration. It takes time to develop good practice in that field.
Portugal												As mentioned previously, the experience with IPPC permits is still limited and consequently, no evaluation was performed yet. However, in the evaluation promoted by the General Directorate for Energy (outside IPPC), indexes for energy efficiency or specific use of energy are used (under the Decree-Law no. 58/82 of 26 February 1982). The use of waste energy, previous measures for energy saving, planned measures for energy saving and planned measures for environmental investments are also considered when providing grants for industry within several financing programmes with the objective to improve energy efficiency (among other objectives), such as: the Energy Programme; the POE, Operational Programme for Economic Activities; the PEDIP II, Strategic Programme for the Dynamisation and Modernisation of Portuguese Industry; and the SIURE, Incentive System for the Rational Use of Energy (all of them a responsibility of the Ministry of Economy, which also involves the General Directorate of Energy and the General Directorate of Environment).
Sweden	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	All of the above will be taken into consideration as appropriate.
The United Kingdom	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	

3.3.3 Are there other items that the authority takes into consideration when evaluating energy efficiency? Are there any integrated measures to evaluate energy efficiency with these other items?

Table 35	Use of non fossil fuels	Transportation	Water consumption	Air pollution abatement	Noise abatement	Waste management	Other	Please, specify:
Austria	Yes	No	Yes	Yes	Yes	Yes	No	
Denmark	Yes	No	Yes	Yes	Yes	Yes	No	
Finland	Yes	No	Yes	Yes	Yes	Yes	Yes	The cross-evaluation of the effect on energy efficiency might occur as a secondary issue.
France	Yes	No	Yes	Yes	No	Yes	No	
Germany	No	No	Yes	Yes	Yes	Yes	Yes	Fuel etc. and their emissions.
Ireland								The above issues are addressed in the permit under a condition called Objectives and Targets. The EPA has always tried to encourage projects, which have a “Cleaner” approach and also reduce energy consumption.
Italy								See previous point.
Lithuania	Yes	No	Yes	Yes	No	No	No	
The Netherlands	Yes	Yes	Yes	Yes	Yes	Yes	No	
Poland	-	-	-	-	-	-	-	See: comments above.
Portugal	Yes	No	Yes	Yes	Yes	Yes	Yes	Water pollution abatement and risk assessment. See the previous answer – under the financing programmes mentioned, all these issues are considered, but its integration with energy efficiency issues can be improved.
Sweden	Yes	Yes	Yes	Yes	Yes	Yes	Yes	All of the above will be taken into consideration as appropriate and in addition, energy used in producing the raw material or chemicals used might be considered.
The United Kingdom	Yes	No	No	Yes	Yes	Yes	Yes	Water pollution abatement.

3.3.4 Do you have any guidelines on how the choice of fuel is dealt with in the permit?

Table 36	Yes or no	Please, specify what kind of guidelines:
Austria	No	
Denmark	No	
Finland	No	
France	No	
Germany	No	
Ireland	Yes	There is a BATNEEC Guidance note for each sector. This note supplies information such as the types of fuel that should be used.
Italy	No	
Lithuania	No	
The Netherlands	No	No general guidelines, but minimal CO_2 effect and other emissions like SO_2, NO_X etc. are normally considered.
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom	Yes	Selection is based on minimisation of all pollutants and may therefore need to include wider consideration other than just energy efficiency.

3.3.5 Do you have any guidelines on how co-generation of heat and power is dealt with in the permit procedure?

Table 37	Yes or no	Please, specify what kind of guidelines:
Austria	No	
Denmark	No	
Finland	No	
France	No	
Germany	No	
Ireland	No	
Italy	No	
Lithuania	No	
The Netherlands	Yes	The use of residual heat is stimulated, but can not be enforced.
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom	Yes	CHP is considered as one of the techniques to improve efficiency of energy conversion and use.

3.3.6 Could changes in energy efficiency affect an existing permit?

Table 38	No	Yes, reconsid-eration of the permit	Yes, consideration/ reconsideration of a permit condition	Please, specify:
Austria	-	x	x	If changes in the energy situation leads to higher emissions (offending emission limits), the permit or conditions of the permit needs to be considered.
Denmark	-	x	x	
Finland	x	-	-	
France	-	-	-	According to French legislation, an important change in process allow the environmental authority to re-consider the permit.
Germany	-	x	x	If it is a severe deviation from the permit and the re-ferred planning application there has to be a new permit.
Ireland	-	-	x	
Italy				See point 3.3.1
Lithuania	-	-	x	
The Netherlands	-	x	x	For example if a company does no longer comply with the voluntary agreement.

Poland	-	x	-	Changes in BAT may affect an existing permit – if these changes allow to reduce the emissions significantly without excessive costs, the permit is reconsidered.
Portugal	-	x	-	
Sweden	-	-	x	Conditions can be reconsidered e.g. if BAT has changed (Chapter 24, sections 3 and 5 of the Environmental Code).
The United Kingdom	-	-	x	

Comments:
Portugal: The environmental permit has to be re-evaluated by the authorities if there is a change in the type of fuel used or a higher production and/or higher consumption of fuel, among other things.

3.4 Permit conditions

3.4.1 How is the requirement for energy efficiency incorporated into the permit?

Table 39	As a binding permit condition	As a general consideration within other permit conditions	As a general consideration in the general/ recital part of the permit	Please, specify:
Austria	No	Yes	Yes	
Denmark	No	Yes	No	See statutory order from the Ministry of Environment and Energy No. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000. Part 7 §12-13 and Annex 2, F18, F19 and G24.
Finland	Yes	Yes	Yes	
France	No	No	Yes	
Germany	Yes	No	No	Mostly like this: "The application documents ...(cited) are part of the permit." That means, the applicant is legally bound to each detail in that documents. The document must show energy efficiency concrete, detailed and specific.
Ireland	No	No	Yes	Please revert to Question 1.1.3 which shows the wording of the "Condition" adopted by the Irish EPA when granting new licences.
Italy				See point 3.3.1
Lithuania	No	Yes	No	
The Netherlands	Yes	Yes	Yes	
Poland	Yes*	No	No	*The permit shall specify in particular: type and quantity of consumed energy, materials, raw-materials and fuels, the sources of origination, of the sites of substance and energy release into the environment.
Portugal	No	No	Yes	However, this might be changed with the attribution of more permits to energy-intensive installation whose BREFs explicitly state energy consumption values as result of one/more BATs. In these situations, the requirement for energy efficiency may be incorporated into the permit as a binding permit condition.

Sweden				Experience is still very limited, but, in principle, both the first and the third alternatives are likely to be used. It is not entirely clear to us what is meant by the second alternative.
The United Kingdom	Yes	No	No	

3.4.2 What kind of binding permit conditions are in use or considered to be used?

Table 40	Energy use per tonnes of product	Maximum use of energy per year	Obligation to improve the energy efficiency	Other specific measures	Please, specify:
Austria	Yes	No	No	No	
Denmark	No	No	Yes	No	See statutory order from the Ministry of Environment and Energy No. 807 of 25 October 1999 on permits for listed activities and installations as last amended by statutory order no. 107 of 1 February 2000. Annex 2, F18, F19 and G24.
Finland	No	No	Yes	Yes	
France					No study were conducted up to now. The first item was used for energy saving agreements.
Germany	No	No	No	Yes	What other specific measures are required depends on what is missing or insufficient in the application documents.
Ireland					Not applicable
Italy	No	No	Yes (usually)	No	
Lithuania	No	No	Yes	No	
The Netherlands	No	No	No	Yes, often derived from agreement plans	If the energy situation is not clear at the moment of application often an analysis or investigation of the situation is imposed.
Poland	-	-	-	-	The law doesn't specify that matter, besides the obligations are not in force yet.
Portugal	Yes	No	Yes	Yes	Obligation to monitor energy consumption to evaluate energy efficiency, as well as an obligation to develop actions aiming to obtain maximum energy efficiency. These actions are required to have associated deadlines and have to be integrated in the Environmental Performance Plan to be approved by the Environmental Authority (General Directorate for Environment # Environment Institute), as a part of the IPPC permit.
Sweden	Yes	Yes	No	-	The experience is still very limited, but, in principle, the two first alternatives could be used including a specification of the maximum permissible amount of fossil fuel that is allowed to be used any year. The last alternative does not sound precise enough to be used as binding permit conditions.

The United Kingdom	No	No	Yes	Yes	Applicant must comply with specific basis energy requirements and further conditions based either on a site-specific BAT appraisal or participation in (and compliance with) a non-regulatory energy efficiency scheme.

3.4.3 Do you have any other kind of permit conditions about energy use?

Table 41	Condition on clarifying energy use and efficiency	Condition on goals concerning energy use and efficiency	Please, specify:
Austria	No	No	
Denmark	No	No	
Finland	No	No	
France	Yes	No	
Germany	No	No	
Ireland			Please see question 1.1.3.
Italy			Quantified target concerning energy use are set by law in Italy but they must be achieved by energy (detentors) delivering companies.
Lithuania	No	No	
The Netherlands			See 3.4.2
Poland	No	No	
Portugal	No	No	No other conditions are applicable presently, but in the future both can be used.
Sweden			Experience is still very limited, but, in principle, both could be used. However, the clarifying in the first should in principle be done in the application.
The United Kingdom	No	No	

3.4.4 Are there any differences between new and existing installations (e.g. in terms of the timetable for implementing energy efficiency)?

Table 42	Yes or no	Please, specify:
Austria	No	Energy efficiency is only considered for new installations and substantial changes of existing installations. See 1.3.3.
Denmark	No	The legislation has not been changed on this part.
Finland		This far, there is too little experience to judge. If the efficiency at a new plant is worse than that of the old plant, the reasoning behind it all, would probably be accepted by the authority.
France	Yes	
Germany	Yes	Existing installations have to meet the general principle of energy efficiency in 2007.
Ireland	Yes	New facilities and facilities that are having their old licence revised have the permit condition (Question 1.1.3) included in their licence. Facilities, which received their licence before the IPPC Directive, have not a specific permit condition in their licence in relation to Energy efficiency. For this reason, once the IPPC Directive is enacted in Ireland (2002), there will be a revision of the licences for all existing facilities between 2002 and 2007.
Italy		NO ANSWER
Lithuania	Yes	From the year 2003 new installations should comply BAT requirements, existing installations during period 2003–2007, the latest 2007, have to meet the same requirements.
The Netherlands	Yes	For new plants generally immediately, existing plant in accordance to the proposed (or imposed) timetable.
Poland	-	See point 1.3.3.
Portugal	No	Currently, energy efficiency is dealt only by the specific legislation regarding energy intensive consumer installations, which have to comply with DL 58/82 of 26th February and Decree (Portaria) 359/82 of 7th April, as mentioned before.

Sweden	No	Not as a general rule. In practice, however, new installations are likely to find requirements on energy efficiency easier to fulfil than would older installations.
The United Kingdom	No	See response earlier.

Comments:
Portugal: Energy efficiency is dealt only by the specific legislation regarding energy intensive consumer installations, which have to comply with DL 58/82 of 26th February and Decree (Portaria) 359/82 of 7th April.

3.5 Best available technique (BAT)

3.5.1 Are the EU BREFs useful when assessing energy efficiency in the permitting process?

Table 43	Yes or no	Please, specify:
Austria	Yes	For the applicant: BREFs are basic requirements for planning. For the authority: BREFs represent minimal demands for the project.
Denmark	No	The experience from the use of the recommendations in the BREFs are still very limited. In our opinion only very few BREFs deal with energy efficiency in a way that make them useful. Hopefully next generation of BREFs will deal with this question in more details.
Finland	Yes	At least some BREFs already include useful information (e.g. cement and lime).
France	Yes	The aspects related to energy efficiency are not enough developed in some BREFs.
Germany	Yes	But not very much, because data are not very specific.
Ireland		NO ANSWER
Italy	Yes	In principle all the information about energy use of technologies is useful.
Lithuania	No	
The Netherlands	No	Generally not as there are few documents with specific demands for energy. Exceptions are the BREFs on ammonia, chlorine alc. and aluminium.
Poland	-	It is impossible to answer the questions if the new law concerning IPPC and BAT is not in force yet. It takes time to learn what documents and in what way will be used in practice in the permitting procedure.
Portugal	Yes	As a guidance document for the authority. However, there is room for improvement in the usefulness of the BREFs.
Sweden		The usefulness of the BREFs could in general be improved in this respect. One example of a useful BREF is the one on the Pulp and Paper Industry.
The United Kingdom		Yes in part. Some BREFs do not provide a great deal of information and a consistent format is not used.

3.5.2 Are there differences concerning energy efficiency in BREFs between new and existing installations?

Table 44	Yes or no	Please, specify:
Austria	No	It has to be considered though that existing installations are the basis for energy data included in the BREFs.
Denmark	No	
Finland		We have not evaluated all BREFs for this purpose. There should not be remarkable differences because data in BREFs are based on well-performing installations.
France	Yes	Usually, new processes are more energy efficient than old processes. Thus, it is harder to make the process of an existing installation as efficient as a new process. In that respect, differences are not surprising.
Germany		Should be investigated within the project.
Ireland		NO ANSWER
Italy		Being the BREFs basically sectoral documents, each consideration or comparison is very difficult and in any case requires the thorough knowledge of all the documents.
Lithuania	Yes	In BAT Reference documents are set parameters for assessment of compliance to BAT. These parameters are applied for new installations. Existing installations use these parameters as a target.
The Netherlands		Not applicable, with the exception of those mentioned in 3.5.1.
Poland	-	See 3.5.1.
Portugal	Yes	For example Cement and Lime Industry BREF, where the heat balance value associated to BAT is only valid for new plants and major upgrades.

Sweden	We have not studied and evaluated all BREFs for the purposes of this exercise, but there should be no distinction since the BREF data are based on existing well-performing installations and reflect BAT for the sector. Of course, in individual cases, BAT could differ between new and existing installations e.g. as regards the timetable.
The United Kingdom	Possibly, I have not checked this. It seems more relevant that they are listed for different technology types and then to consider which technology would be the "new" plant.

3.5.3 Are data in current BREFs sufficient for considering energy efficiency in new and existing installations?

Table 45	New installations: Yes or no	Please, specify:	Existing installations: Yes or no	Please, specify:
Austria	No	In most BREFs there are no detailed energy data. The BREF on glass manufacturing industry does not contain BAT conclusions relating to energy efficiency. The same is the case for the cement and lime manufacturing BREF, although energy use was marked as a key environmental issue. In any case the energy data are kept far too general, which is not a great help for complex industry sectors.	No	
Denmark	No		No	
Finland	No		No	Better monitoring and data required.
France	No	This topic is quite complicated. Data in BREF are still too scarce. Data provided by the applicant are hard to cross-check at project level.	No	The topic is still complicated. Data in BREF are still too scarce. But data from the applicant are easier to check.
Germany	No	Data are not very specific.	No	Data are not very specific.
Ireland		NO ANSWER		NO ANSWER
Italy		See above.		See above.
Lithuania	Yes		Yes	
The Netherlands	No	See exceptions in 3.5.1	No	See exceptions in 3.5.1
Poland	See 3.5.1			
Portugal	No		No	Many BREFs still do not have detailed information or all the relevant activities regarding energy efficiency (e.g. for lime production there is no such information). The BREFs content could be made more readable and uniform (e.g. using similar parameters, such as energy consumption per tonne produced). All the values indicated should be clearly presented as benchmarks to the sector and, if possible for each process considered. Especially for new installations there should be always an energy efficiency value attainable with the suggested BATs.
Sweden	No	They can never be since the BREFs are based on existing installations.	No	It varies between the BREFs, but, in general, there is considerable room for improvement. In principle, a BREF can never be sufficient for determining BAT for any aspect. They are only guiding documents, which are to be taken into account.

The United Kingdom	No	No

3.5.4 Are there some specific problems with the use of BREFs concerning energy efficiency?

Table 46	Yes or no	Please, specify:
Austria		As energy efficiency is a rather new permit condition there is not much experience.
Denmark	Yes	See 3.5.1
Finland	Yes	Lack of comparable data.
France	Yes	Some processes designed to reduce pollutants emissions enhance energy consumption. These aspects should be made clear in BREF.
Germany	Yes	It is not possible, to distinguish whether a higher energy input is caused by harder efforts for cleaning of air and water or worse insulation, reuse of heat, insufficient catalysts or site-specific factors or whatsoever.
Ireland		NO ANSWER
Italy		See above.
Lithuania	Yes	It is not always clear how to use data from BAT while setting permit conditions.
The Netherlands	Yes	See 3.5.1
Poland	-	See 3.5.1
Portugal	Yes	See answer to the previous question. Furthermore, the BREFs could deal in more detail with the integration of energy efficiency and reduction of greenhouse gases (when applicable). Finally, the fact that some abatement techniques lead to increase in energy consumption is not sufficiently dealt with.
Sweden	Yes	Yes, lack of data which is due to the fact that industry tends to keep energy data secret.
The United Kingdom	Yes	There is not enough information on energy and the basis is not always presented clearly.

3.5.5 How should BREFs be developed in terms of energy efficiency?

Table 47	More information on energy consumption	More information on energy efficiency techniques	Consistent basis for energy reporting	Consideration of trade-offs between energy use and other environmental impacts	Other	Please, specify:
Austria	Yes	Yes	Yes	Yes	No	Energy aspects should be dealt with in a more comprehensive way mainly in sector specific BREFs. A horizontal BREF should only contain generally applicable techniques and general principles.
Denmark	Yes	Yes	Yes	Yes	No	
Finland	Yes	Yes	Yes	No	No	Reporting of energy consumption as kWh/tonne (raw material or products).
France	Yes	Yes	Yes	Yes	No	
Germany	Yes	Yes	Yes	Yes	No	
Ireland						NO ANSWER
Italy						No single answer is possible. It depends on single BREF.
Lithuania	No	Yes	No	No	No	
The Netherlands	Yes	Yes	Yes	Yes	No	
Poland	-	-	-	-	-	See 3.5.1
Portugal	Yes	Yes	No	Yes	Yes	Clarification of which methods to use in order to assess energy efficiency in each specific situation or, alternatively its consideration in the monitoring BREF.
Sweden	Yes	Yes	No	No	Yes	More data on energy production possibilities at the installations

						and on the possibility to use excessive heat e.g. for district heating perhaps after heat-pumps. Industry should take its responsibility to exchange information on energy use per produced unit at the best performing installations in different sectors.
The United Kingdom	Yes	No	Yes	Yes	No	

3.5.6 Are there any particular BREFs that your country would like to see revised early on due to e.g. lack of data and/or conclusions concerning energy efficiency techniques?

Table 48	Yes or no	Please, specify:
Austria	Yes	Primarily BREFs should be revised in those sectors where a high number of installations exists in Austria (e.g. cement and lime manufacturing industry; pulp and paper).
Denmark	Yes	Almost all.
Finland	(Yes)	In general, more data on energy consumption and efficient use of it should be added in BREFs. A new horizontal BREF on energy efficiency could give the basic information for sectoral BREFs.
France	No	Most of the BREFs are still in process or to come. Considering the amount on energy needed to issue a BREF, efforts should be on making the BREFs to be approved better.
Germany	No	
Ireland		NO ANSWER
Italy		See above.
Lithuania	No	
The Netherlands		No clear picture, as there is so little experience
Poland	-	See 3.5.1
Portugal	Yes	All of them, but probably there would be more urgency in the Cement and Lime and Glass BREFs.
Sweden	No	The problem is not more pronounced in any particular BREF.
The United Kingdom	No	

3.5.7 Would a horizontal BREF (common to several industrial sectors) on energy efficiency techniques be useful?

Table 49	Yes or no	Please, specify:
Austria	Yes	A horizontal document can never replace a more comprehensive inclusion of energy efficiency in sector specific documents.
Denmark	Yes	
Finland	Yes	That might clarify the different aspects of energy efficiency and give some examples on national guidance.
France	No	The problems are too technology-specific or process-specific to be treated properly at a horizontal level.
Germany	No	There are some similarities between usable techniques in some cases e.g. chemical/petrochemical/refinery processes but oftentimes the possible measures depend on what other installations are combined in one site and if there are neighbouring facilities to use the off heat. Nevertheless a horizontal BREF could give good guidance on principles and definitions for the authorities.
Ireland		NO ANSWER
Italy	Yes	
Lithuania	Yes	
The Netherlands	Yes	
Poland	Yes	
Portugal	Yes	The sector specific energy issues should be dealt into each sector-based BREF.
Sweden	No	Energy efficiency is in most cases closely linked to the processes used. The experience from horizontal BREFs so far is not very encouraging when it comes to usefulness.
The United Kingdom	No	UK has now produced this sort of guidance already.

3.5.8 Do you use any other international sources than the BREFs to evaluate BAT for energy efficiency?

Table 50	PARCOM	HELCOM	Nordic BAT documents	Other	Please, specify:
Austria	No	No	No	No	As energy efficiency is a rather new permit condition there is not much experience.
Denmark	No	No	No	No	
Finland	No	No	Yes	No	Nordic BAT documents and communication between the countries could be utilised more.
France	Yes	No	No	Yes	ADEME documents or studies, which are based on international synthesis of legislation and technology.
Germany	No	No	No	No	
Ireland					NO ANSWER
Italy	No	No	No	No	Of course Italian documents and all other available documents
Lithuania	No	Yes	Yes	No	
The Netherlands	No	No	No	No	As far as known not.
Poland	-	-	-	-	See 3.5.1
Portugal	No	No	No	No	No other international sources are used presently.
Sweden	No	No	No	No	
The United Kingdom	No	No	No	No	

3.5.9 Do you have any national sector-wise evaluation of BAT including energy efficiency?

Table 51	Yes or no	Please, specify:
Austria	No	There are only sector specific BAT considerations concerning ELVs for air and water. When prescribing ELVs the energy use of certain end of pipe technologies was taken into account but not considered methodologically.
Denmark	No	
Finland		Not particularly, but e.g. “Finnish Expert Report on Best Available Techniques in Large Combustion Plants” contains information on energy efficiency in large combustion plants.
France	No	
Germany	Yes	In singular cases e.g. steel mills binding guideline “Technische Anleitung zur Reinhaltung der Luft (TA Luft – Technical instructions on air quality control)”.
Ireland		NO ANSWER
Italy	Yes	ANPA is developing sector-wise guidelines trying to include also energy efficiency.
Lithuania	No	
The Netherlands	Yes	For branches or installations not participating in the benchmarking or MJA-agreements (see 1.1.7) there are technical information sheets specifically for energy measures.
Poland	No	
Portugal	No	Not presently, however the Portuguese IPPC Consultation Committee will soon start working evaluating the adequacy of the BATs to the Portuguese industry, and thus will also consider energy efficiency. The existing technological centres (sector-based) also develop work in this area, which will be considered by the Committee.
Sweden	No	
The United Kingdom		NO ANSWER

4 VOLUNTARY ENVIRONMENTAL MANAGEMENT SYSTEMS

4.1 ISO 14001

4.1.1 What is the role of ISO 14001 in the permit procedure?

Table 52	Part of the permit procedure	Background material	Other	Please, specify:
Austria	No	Yes	No	
Denmark	No	Yes	No	
Finland	No	Yes	No	
France	No	Yes	No	
Germany	No	No	Yes	Applicants are allowed to use documents as application documents, which have been used in the ISO-process, if they are specific enough. This is very rarely the case because ISO is applied to the company taken as whole in regard to the existing site(s) and not to planned single installations.
Ireland	No	Yes	Yes	Irish permits require that the company have an Environmental Management Programme in place. The ISO 14001 system is accepted by the EPA as an EMP in the permit procedure.
Italy	No	Yes	No	Refers to Decree 489 n° 273.
Lithuania	No	Yes	No	
The Netherlands	No	Yes	No	In general management schemes do not play a dominant role in permit procedures unless a applicant wants a so called “headline-permit”. In that case the permit will take over parts of the scheme (mostly certified).
Poland	No	No	No	No role.
Portugal	No	Yes	Yes	Applicants can deliver a complementary report together with the application form, including relevant information to the evaluation (Section B.8.2 of the application form). A description of any environmental management system can be included here.
Sweden	No	No	No	Might be used as an argument by the applicant in arguing that no specific requirement should be set.
The United Kingdom	No	Yes	No	

4.1.2 Are there legislative possibilities for the use of ISO 14001 in the permit procedure?

Table 53	Yes or no	Please, specify:
Austria	No	There are only legislative possibilities in the supervision procedure. ISO documents must be recognised as documents for the self evaluation of the installation in accordance with the Trade and Industry Act (Sec 82b (5)).
Denmark	No	
Finland	Yes	Environmental Protection Decree 19 §: “Where necessary, the permit decision must also indicate how environmental management systems or measures and reporting based on energy-saving agreements have been taken into account in setting the terms of the permit.”
France	No	
Germany	No	
Ireland	No	
Italy	Yes	See previous point.
Lithuania	No	
The Netherlands		See 4.1.1
Poland	No	
Portugal	Yes	See previous answer.
Sweden	No	There is no language to that effect.
The United Kingdom	No	

4.1.3 Has the certification in ISO 14001 a role in the permit procedure concerning energy efficiency?

Table 54	Yes or no	Please, specify:
Austria	No	Energy efficiency must be reviewed on the concrete project.
Denmark	No	
Finland	No	
France	No	
Germany	No	
Ireland	No	The EPA may use the certification as a useful tool when carrying out its own environmental audits of a company. An example of this might be to look at the findings of an ISO 14001 audit and inspect whether or not non-compliance and observations were closed off.
Italy	Yes	Not clearly specified but it is part of the integrated approach.
Lithuania	Yes	Presence of ISO 14001 facilitates permitting procedure.
The Netherlands		See 4.1.1
Poland	No	
Portugal	No	ISO 14001 certification does not guarantee that the installation use energy efficiently, it merely indicates its commitment and effort in doing so.
Sweden	Yes	See 4.1.1
The United Kingdom	Yes	It may satisfy some of the energy management requirements.

4.1.4 Does ISO 14001 influence supervision of energy efficiency?

Table 55	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	No	
Finland	Yes	Only on a voluntary basis. The implementation is supervised by certifiers.
France	No	
Germany	No	
Ireland	Yes	The system requires that staff is properly trained and that issues such as calibration maintenance and document controls are closely managed. Energy efficiency might well be a key performance indicator in their ISO 14001 Environmental Policy Statement. For these reasons ISO 14001 will serve to compliment the permitting of energy efficiency.
Italy	Yes	See previous point.
Lithuania	Yes	Implementation of ISO 14001 simplifies supervision procedures due to complete system of operator's self-control and documentation.
The Netherlands		As far as there is a link with the permit (see 4.1.1).
Poland	No	
Portugal	Yes	As mentioned in the previous answer, the certification does not guarantee performance, however, it facilitates energy management and thus, its supervision.
Sweden		Will perhaps be taken into account to some degree.
The United Kingdom	Yes	Possibly, although it will not be a major influence.

4.1.5 Are there some specific advantages for co-ordination of ISO 14001 and the permit procedure concerning energy efficiency?

Table 56	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	Yes	The advantages are on the side of the companies.
Finland	No	The environmental authorities are able to ask the certifiers to pay closer attention to the area of energy efficiency.
France	No	
Germany	No	See 4.1.1.
Ireland	Yes	As above. Co-ordination of the two would provide tight control of the activity as it would have to meet ISO requirements as well as the permit requirements. Both sets of requirements may well be similar, however there will be two different bodies available to assess the companies' objectives, targets and results.
Italy	Yes	Simplification of the procedure.

Lithuania	Yes	There are advantages in preparing application documents and also for conducting of self-control for companies, which have implemented ISO 14001.
The Netherlands	Yes	By taking parts of the scheme over in the permit applicants can avoid extra workload.
Poland	No	
Portugal	Yes	On the company side mainly, since the operators will have less governmental entities to deal with.
Sweden	No	The type of data, which emanates from ISO 14001 might be useful but could be elaborated.
The United Kingdom	Yes	Possibly to make the procedures compatible.

4.1.6 Are there some specific problems for co-ordination of ISO 14001 and the permit procedure?

Table 57	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	No	
Finland	Yes	ISO is a voluntary instrument and should stay so.
France	No	
Germany	Yes	See 4.1.1.
Ireland	No	There is no reason why both should not operate “hand in hand”.
Italy	No	See previous point.
Lithuania	No	
The Netherlands	Yes	If a permit simply refers to information from a scheme the legal status is doubtful.
Poland	Yes	ISO 14001 is a voluntary system not regulated by law.
Portugal		We have no experience in this matter yet. See answer 4.1.3 – the certification authorities do not certificate performance which is the ultimate objective of the permit.
Sweden	No	There are no specific problems, but the lack of openness, which the ISO system provides for, could cause problems.
The United Kingdom	Yes	ISO 14001 does not say whether energy targets are realistic in context of IPPC.

4.2 EMAS

4.2.1 What is the role of EMAS in the permit procedure concerning energy efficiency?

Table 58	Part of the permit procedure	Background material	Other	Please, specify:
Austria	No	Yes	No	
Denmark	No	Yes	No	
Finland	No	Yes	No	
France	No	Yes	No	
Germany	No	Yes	Yes	Applicants are allowed to use documents as application documents, which have been used in the EMAS process, if they are specific enough. In most cases the documents have to be adopted to the view on the single installation covered by an application/permit process.
Ireland				Irish permits require that the company have an Environmental Management Programme in place. The EMAS system is accepted by the EPA as an EMP in the permit procedure.
Italy	Yes	No	No	EMAS registered sites will benefit of an 8 years validity of the permit instead of a 5 years permit.
Lithuania	No	Yes	No	
Poland	No	No	No	No EMAS in Poland.
The Netherlands	No	Yes	No	In general management schemes do not play a dominant role in permit procedures unless a applicant wants a so called “headline-permit”. In that case the permit will take over parts of the scheme (mostly certified).
Portugal	No	Yes	Yes	Same answer as in 4.1.1.
Sweden	No	No	No	EMAS has so far not played any role.
The United Kingdom	No	Yes	No	

4.2.2 Are there legislative possibilities for the use of EMAS in the permit procedure?

Table 59	Yes or no	Please, specify:
Austria	Yes	To a certain extent. The Environmental Management Act (Umweltmanagementgesetz UMG), Fed. Law Gaz. I No. 96/2001 which came into force on August 8, 2001, provides certain benefits for EU EMAS organisations (EU Regulation 761/2001). According to Section 21 UMG for registered EMAS organisations a notification procedure is provided for certain changes to an installation instead of different kinds of permitting procedures. One condition is that a binding statement of an environmental verifier exists that inter alia the changes are taking into account state of the art technologies/ BAT. EMAS organisations may obtain a consolidated permit (which means a summary of all existing permits for an installation in one permit, see Section 22 UMG). Sections 23 to 27 of the Environmental Management Act provide simplifications with respect to control and notification obligations. Provisions relating to self-monitoring provide simplifications for companies that have carried out an environmental audit according to EMAS or ISO 14001 (Section 82b para. 5 Trade and Industry Act [Gewerbeordnung 1994, Fed. Law Gaz. No. 194 as amended by Fed. Law Gaz. I No. 111/2002] and Section 134 para. 4 Water Act [Wasserrechts-gesetz 1959, Fed. Law Gaz. 215 as amended by Fed. Law Gaz. I No. 65/2002]).
Denmark	No	
Finland	Yes	See 4.1.2
France	No	
Germany	Yes	The government is authorised to issue a decree on facilitation for documents as application documents.
Ireland	No	Co-ordination of the two would provide tight control of the activity as it would have to meet ISO requirements as well as the permit requirements. Both sets of requirements may well be similar, however there will be two different bodies available to assess the companies' objectives, targets and results.
Italy	Yes	Refers to the law 93 23/3/2001.
Lithuania	No	
The Netherlands		See 4.2.1
Poland	-	See 4.2.1
Portugal	Yes	Please refer to answer to question 4.1.1.
Sweden		Not specifically mentioned but the applicant might find it useful to refer to an EMAS registration.
The United Kingdom	No	

4.2.3 What is the role of the verification of EMAS and the environmental reports in the permit procedure in relation to energy efficiency?

Table 60	
Austria	-
Denmark	The EMAS report could give the required information.
Finland	It varies, the energy issue could play a larger role.
France	There is no involvement of the verification EMAS in the permit procedure.
Germany	Background information for the decision of the authority how detailed and intensive her own investigation and assessment on this issue is necessary.
Ireland	There is not a direct role although the licensee may choose to use the same reports for submission to the EPA in meeting it's objectives and targets requirements. It might also choose to submit these reports to the EPA as part of an Annual Environmental Report.
Italy	Is not mentioned in particular
Lithuania	To facilitate assessment of evaluation of the company.
The Netherlands	See 4.2.1
Poland	See 4.2.1
Portugal	At the moment, none, but in the future the verified environmental declaration might be a good source of background information.
Sweden	See 4.2.2
The United Kingdom	It may help to satisfy some of the energy management requirements.

4.2.4 Does EMAS influence supervision of energy efficiency?

Table 61	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	No	
Finland	Yes	The implementation is supervised by verifiers.
France	No	
Germany	Yes	Reducing of authority supervision can be possible. The Artikelgesetz which implements the IPPC directive into German federal law stipulates, that the self-surveillance measures in the context of EMAS can supplement certain supervision measures by the authorities. Yet this stipulation has to be set into action by a government regulation which does not exist at the moment. In general, each authority has to decide in a case by case decision how intense her own supervision can be and has to be in regard of the potential problems and her personal resources.
Ireland	-	The system requires that staff is properly trained and that issues such as calibration maintenance and document controls are closely managed. For these reasons EMAS will serve to compliment the permitting of energy efficiency.
Italy	No	
Lithuania	Yes	See 4.1.1
The Netherlands	-	As far as there is a link with the permit (see 4.2.1).
Poland	-	See 4.2.1
Portugal	Yes	The certification facilitates energy management and thus, its supervision.
Sweden	-	The experience of supervision of energy efficiency is very limited. Thus, we cannot reply to this question at this stage.
The United Kingdom	Yes	Possibly, though not a major influence.

4.2.5 Are there some specific advantages for co-ordination of EMAS and the permit procedure?

Table 62	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	Yes	The advantages are on the side of the companies.
Finland	Yes	There could be.
France	No	
Germany	No	See above (4.2.4.)
Ireland	-	Co-ordination of the two would provide tight control of the activity as it would have to meet ISO requirements as well as the permit requirements. Both sets of requirements may well be similar, however there will be two different bodies available to assess the companies' objectives, targets and results.
Italy	Yes	The co-ordination allows a simplification of the licensing procedure.
Lithuania	Yes	See 4.1.5
The Netherlands	Yes	By taking parts of the scheme over in the permit applicants can avoid extra workload.
Poland	-	See 4.2.1
Portugal	Yes	On the company side mainly, since the operators will have less governmental entities to deal with and also on the administration side as the data presented is already verified and the company is already compromised with an environmental management system.
Sweden	No	However, the applicant might find it useful to extract some information from EMAS reports.
The United Kingdom	-	As for ISO 14001.

4.2.6 Are there some specific problems for co-ordination of EMAS and the permit procedure concerning energy efficiency?

Table 63	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	No	
Finland	No	
France	No	
Germany	Yes	See above.

Ireland	No	The only issue would be that the licensee is required to publish an Environmental report under EMAS. This is something that may worry some facilities as they may wish to withhold confidential information.
Italy	No	Not in particular.
Lithuania	No	
The Netherlands	Yes	If a permit simply refers to information from a scheme the legal status is doubtful.
Poland	-	See 4.2.1
Portugal	Yes	We have no experience in this matter yet.
Sweden	No	See above.
The United Kingdom	-	As for ISO 14001.

Comments:
The Netherlands: As far as EMAS is used the answers are the same as for ISO 14001.

5 VOLUNTARY ENERGY SAVING AGREEMENTS

5.1 General questions

5.1.1 Is the concept of voluntary energy saving agreements in use in your country?

Table 64	Yes or no	Please, specify:
Austria	No	
Denmark	Yes	Individual companies within specified branches can make voluntary energy saving agreements with the Energy Agency.
Finland	Yes	Voluntary energy saving agreements has been in use since 1998.
France	Yes	Five energy saving agreements were concluded in the mid-90's. They were meant to save on carbon dioxide emissions.
Germany	Yes	Commitment 1995, renewed and extended 1996 (now agreement) to make efforts to reduce CO_2 emissions, half of the industrial branches implement it by reductions of their specific energy consumption.
Ireland	Yes	The Irish Energy Centre operates a voluntary Self-Audit Energy Scheme in which 76 companies in Ireland take part.
Italy	Yes	It is generally used, but there are no national guidelines or rules to define a standard agreement.
Lithuania	No	
The Netherlands	Yes	See 1.1.7
Poland	No	
Portugal	No	There are no voluntary saving agreements in Portugal.
Sweden	No	Such agreements are currently considered, but negotiations have not yet commenced.
The United Kingdom	Yes	"Climate Change Agreements" are in place in several industrial sectors since April 2001. These provide an 80 % discount from energy tax on coal, gas and electricity in return for a negotiated, binding energy reduction target. Emissions trading for greenhouse gases, including CO_2 emissions from energy use, is scheduled to be in place by April 2002.

5.1.2 If you have an agreement do the objectives apply to the

Table 65	Installation	Company	Operator (legal person)	Industrial branch	Other	Please, specify:
Austria	-	-	-	-	-	
Denmark	No	Yes	No	Yes	No	See added material.
Finland	No	Yes	No	No	No	
France	No	Yes	No	Yes	No	At company level, an energy saving agreement was concluded with PECHINEY. At industrial branch level, 4 energy saving agreements in industry were concluded with energy intensive sectors: - steel industry: fédération française de l'acier, - chambre syndicale nationale des fabricants

						de chaux grasses et magnésiennes, - cement industry: syndicat français de l'industrie cimetière, - glass industry: chambre syndicale des verreries mécaniques de France.
Germany	No	No	No	Yes	No	
Ireland	? See below.	No	No	No	No	The objectives of the agreement generally apply to a particular site location.
Italy						It depends on the agreement.
Lithuania	-	-	-	-	-	
The Netherlands	No	Yes	Yes	Yes	No	In most cases companies join an agreement and work out their own plans/objectives. In case of MJA (see 1.1.7) reduction targets are agreed on branch level.
Poland	-	-	-	-	-	
Portugal	-	-	-	-	-	
Sweden						All alternatives – and combinations of them – would be considered (see 5.1.1). However, in order to obtain a legally binding and enforceable agreement it is likely that the operator/company level will have to be included somehow.
The United Kingdom	No	Yes	No	Yes	No	Several types of agreement exist. The main agreement is in most cases between govemment and a representative trade body, which has underlying agreements with individual companies. Individual companies may also have agreements directly with government.

5.1.3 How many industrial installations have joined the voluntary energy saving agreement?

Table 66	Number of IPPC installations	Number of other installations
Austria	-	-
Denmark	114 industrial companies.	
Finland	Approximately 125 installations.	Approximately 125 installations.
France	Estimation: 100–200 (IPPC directive, Annex 1). It is an expert estimation, the database used is probably not complete and has not yet been thoroughly checked for double counting.	Estimation: 550 installations.
Germany	There was only the following information available: The participating industrial federations represent more than 4 000 operators. Each can include one or more installations. It can be estimated that nearly all of the IPPC installations and most of the other industrial installations are included. (In the Land Northrhine-Westphalia there are about 2 900 IPPC installations.)	
Ireland	(IPPC directive, Annex 1) Mostly IPPC installations.	
Italy	No information available at the moment.	No information available at the moment.
Lithuania	-	-
The Netherlands	Unknown	Unknown.
Poland	-	-
Portugal	-	-
Sweden		See above.
The United Kingdom	Not known	12 500 total installations, including IPPC.

5.1.4 Approximately what percentage of total energy consumption by industrial operations in your country is consumed by these installations?

Table 67	Percentage of IPPC installations	Percentage of other installations
Austria	-	-

Denmark	The agreement cover approx. 60 % of the energy used in manufacturing industry.	
Finland	> 80 %	< 20 %
France	An estimation is that those installations represent about 30 % of net consumption of energy.	
Germany	The installations operated by the participants represent at least 70 %, likewise 80 % of the total industrial energy consumption (estimated).	-
Ireland	> 33 %	
Italy	No information available at the moment.	No information available at the moment.
Lithuania	-	-
The Netherlands	99 %	
Poland	-	-
Portugal	-	-
Sweden		See above.
The United Kingdom	NO ANSWER	NO ANSWER

Comments:
The Netherlands: Almost all major installations have joined the benchmarking agreement or the MJA scheme (see 1.1.7)

5.2 Voluntary energy saving agreement

5.2.1 If you have an agreement in use, which are the parties involved?

Table 68	
Austria	-
Denmark	Mostly the Danish Energy Agency and the company. Sometimes the sector organisation enter into an agreement on behalf of the members.
Finland	Ministry of Trade and Industry/The Confederation of Finnish Industry and Employers (TT) ⇔ company.
France	The Ministry of environment and the company or the union of the branch concerned.
Germany	The voluntary agreement between German government and industry is based on the declaration of the BDI (Federation of German Industries), BGW (Federal Association of the German Gas and Water Industry), VDEW (Federation of German Electricity Works), VIK (Association of Energy and Power Industries – without own figures because delivering to producing industries and energy balanced there) and VKU (Association of Municipal Enterprises). BDI itself represents 14 individual member associations for different industrial branches/sectors.
Ireland	Installation, Irish Energy Centre.
Italy	It can include several parties.
Lithuania	-
The Netherlands	Two types: benchmarking and MJA (see 1.1.7).
Poland	-
Portugal	-
Sweden	In the discussions, the government is presumed to be one party whereas the other could be one or more of those mentioned in 5.1.2.
The United Kingdom	See 5.1.2

5.2.2 What are the obligations on the parties involved?

Table 69	
Austria	-
Denmark	See added material.
Finland	The aim of the agreement is to promote energy efficiency so as to reduce its specific consumption. A further aim is to work out and introduce operational models that make energy efficiency an integral part of the companies' operation.
France	The union should reach the target in terms of energy savings and report on energy consumption at union or company level.
Germany	1) To reduce CO_2 emission or specific energy consumption by a declared percentage ranging sector wise from 16–17 % to 66 % on the base of 1990 (13 sectors) or 1987 (4 sectors), aggregating to 20 % by the year 2005,

	2) To organise an independent monitoring, 3) To report data and outstanding examples of reducing measures.
Ireland	1) To be part of the core of major players in energy reduction. 2) To share knowledge of energy reduction campaigns and methods. 3) To contribute to the competitiveness of Irish Industry by reducing energy requirements. 4) To achieve overall energy saving. To reduce emissions to the environment.
Italy	It depends on the agreement.
Lithuania	-
The Netherlands	In case of benchmarking: comparison with world top and if necessary an improvement plan In case of MJA: realise the reduction of specific energy set of the branch.
Poland	-
Portugal	-
Sweden	NO ANSWER
The United Kingdom	See 5.1.1

5.2.3 What are the main contents of the agreement?

Table 70	Determination of energy consumption in new installations	Monitoring of energy consumption in existing installations	Energy analysis	Energy inspection	Plan for making energy saving more effective	Energy saving measures	Regular reporting (at what intervals)	Other	Please, specify:
Austria	-	-	-	-	-	-	-	-	
Denmark	No	No	No	Yes	Yes	Yes	Yes	No	Energy management scheme. See added material.
Finland	No	Yes	Yes	Yes, energy audit	Yes	Yes	Yes	No	
France	No	No	No	No	No	No	Yes (annual)	Yes	Energy saving target is linked to CO_2 emission targets.
Germany	No	No	No	No	No	No	Yes	Yes	See 5.2.2. Reporting is annually.
Ireland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Benchmarking, Publication of Case studies, Sharing Information.
Italy	-	-	-	-	-	-	-	-	See previous point.
Lithuania	-	-	-	-	-	-	-	-	
The Netherlands	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Comparison with world top (benchmarking).
Poland	-	-	-	-	-	-	-	-	
Portugal	-	-	-	-	-	-	-	-	
Sweden									All of the above are considered.
The United Kingdom	Yes	Yes	No	Yes	No	No	Yes	No	Agreements describe the total reduction either in absolute or relative terms. Allowances can be made for changes in product output or mix or unforeseen regulatory and planning constraints. Reporting is required at bi-annual milestones. Auditing of a proportion of participants is carried out.

5.2.4 Who is responsible for making energy audits?

Table 71	The operator	The authority	A public organisation	A private organisation (e.g. consult-ants)	Other	Please, specify:
Austria	-	-	-	-	-	
Denmark	No	Yes	No	Yes	No	See added material.
Finland	Yes	No	No	No	Yes	The analysis is done by consultancies cer-tified by Motiva in co-operation with the company.
France	No	No	No	Yes	No	The representative of the branch conduct a detailed monitoring. No energy audit, an independent moni-toring is conducted by the environment authority at branch level.
Germany	Yes	No	No	No	No	
Ireland	Yes	No	No	No	No	
Italy	-	-	-	-	-	See previous point.
Lithuania	-	-	-	-	-	
The Nether-lands	Yes	No	Yes, (NO-VEM or benchmarking authority)	No	No	
Poland	-	-	-	-	-	-
Portugal	-	-	-	-	-	-
Sweden						NO ANSWER
The United Kingdom	No	Yes	No	Yes	No	

5.2.5 How is the fulfilment of the aims of the agreement verified and reported?

Table 72	Specific energy consump-tion	Index for energy efficiency	Fulfilled measures in saving energy	Other	Please, specify:
Austria	-	-	-	-	
Denmark	No	No	Yes	No	See added material.
Finland	No	No	Yes	No	
France	Yes	No	No	No	
Germany	Yes	No	Yes	Yes	Specific CO_2 emission reduction rate, examples of out-standing measures. Investigations by RWI – Rheinisch-Westfälisches Institut für Wirtschaftsforschung Essen, Germany.
Ireland	No	Yes	No	No	For example an Index is developed for the installation. The resulting figure is used to compare energy con-sumption from year to year. The following is an index used by a company participating in the scheme. Energy Utilised/Units Produced.
Italy	-	-	-	-	It depends on the agreement.
Lithuania	-	-	-	-	
The Nether-lands	Yes (in case of MJA)	Yes (bench-marking)	Yes (both)	No	
Poland	-	-	-	-	
Portugal	-	-	-	-	

Sweden					NO ANSWER
The United Kingdom	No	No	No	Yes	Absolute or relative reductions achieved in measured energy use.

5.2.6 To which body do the installations report?

Table 73	Environmental authority	Other state organisation	Private organisation	Please, specify:
Austria	-	-	-	
Denmark	No	Yes	No	The Energy Agency
Finland	No	Yes	No	Motiva
France	Yes	No	No	The branch or professional union collects information from the companies and reports to the ministry.
Germany	No	No	Yes	RWI - Rheinisch-Westfälisches Institut für Wirtschaftsforschung Essen, Germany
Ireland	No	Yes	No	Irish Energy Centre.
Italy				See previous point
Lithuania	-	-	-	
The Netherlands	No	No	Yes	In case of MJA most branches report through the branch organisation. In case of benchmarking through the benchmarking authority.
Poland	-	-	-	
Portugal	-	-	-	
Sweden				NO ANSWER
The United Kingdom	No	Yes	No	At present, government is the reporting authority.

5.2.7 What are the incentives for fulfilling the energy saving agreement?

Table 74	Avoidance of legal sanctions	Lower taxation	Other	None	Please, specify:
Austria	-	-	-	-	
Denmark	No	Yes	Yes	No	Grants for energy saving measures. See added material.
Finland	No	No	Yes	No	Financial aid for the energy analysis (50 % from the MTI) and up to 10 % for the energy saving investments. If the ESA has not been fulfilled, legal sanctions can be considered.
France	No	No	Yes	No	The energy saving agreements and their results are made available to the public.
Germany	Yes	Yes	No	No	Government relinquishes to forward a bill on fixing of measures for energy efficiency and cover energy consumption with higher taxation as far as the industry taken as a whole meets the voluntary agreement.
Ireland	No	No	No	Yes	The agreement is with the Irish Energy Centre & the Minister for Public Enterprise. None compliance with the agreement is viewed as bad publicity for the activity. Therefore the agreement is taken seriously in most cases. Installations also see the positive benefit of saving money in the long run.
Italy					See previous point.
Lithuania	-	-	-	-	
The Netherlands	No	No	Yes	No	Avoidance of enforced permit conditions by individual authorities.
Poland	-	-	-	-	
Portugal	-	-	-	-	
Sweden	Yes	Yes	No	No	Under the current concept, option two seems to be the most likely and viable incentive.

The United Kingdom	No	Yes	No	No	80 % discount on tax on coal, gas and electricity use.

Comments:
Germany: There is a supplementary voluntary agreement between German government and the industrial associations which represent energy suppliers: CO_2-emission reduction $10x10^6$ t/a by 2005 and $20–23x10^6$ t/a by 2010; planning and operation of new installations for co-generation of power and heat; improvement of existing installations for co-generation of power and heat; funding of electric power generated by these installations and other installations operation on the base of renewable energies; reporting and monitoring.
Poland: There are no voluntary energy saving agreements in Poland.

5.3 Voluntary energy saving agreements and permit procedure

5.3.1 What is the role of voluntary energy saving agreements in the permit procedure?

Table 75	Part of the permit procedure	Background material	Other	Please, specify:
Austria	-	-	-	
Denmark	No	No	No	None
Finland	No	Yes	No	Reporting is the same.
France	No	Yes	No	
Germany	No	Yes	No	
Ireland	No	Yes	No	In the AER – Annual Environmental Report
Italy	No	Yes	No	It could be included in the permit procedure case by case.
Lithuania	-	-	-	We have no such agreements.
The Netherlands	Yes	No	No	Saving/reduction measures developed as part of the agreement are incorporated in the permit
Poland	-	-	-	
Portugal	No	Yes	Yes	None, at the moment, but as mentioned in 4.1.1, applicants can deliver a complementary report together with application form, including relevant information to the evaluation, in which this information on agreements can be included.
Sweden	No	Yes	No	It does not seem likely, that voluntary agreements would play a role in the permit procedure (see further 5.3.4).
The United Kingdom	Yes	No	No	

5.3.2 Is there any reference in your legislation to use voluntary energy saving agreements in the permit procedure?

Table 76	Yes or no	Please, specify:
Austria	-	
Denmark	No	
Finland	Yes	Environmental Protection Decree 19 §: "Where necessary, the permit decision must also indicate how environmental management systems or measures and reporting based on energy-saving agreements have been taken into account in setting the terms of the permit."
France	No	
Germany	No	
Ireland	No	
Italy	No	
Lithuania	-	
The Netherlands	No	
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom		Not yet drafted.

5.3.3 Is there any guidance on using voluntary agreements in permit procedure?

Table 77	Yes or no	Please, specify:
Austria	-	
Denmark	No	
Finland	No	
France	No	
Germany	No	
Ireland	No	
Italy	No	There are no guidance.
Lithuania	-	
The Netherlands	Yes	Ministerial decision: "Energie in de Milieuvergunning", dealing with the relation of agreement participation and permits.
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom		At present, non-statutory guidance is provided in regulator's energy efficiency guidance. Statutory guidance is expected from government.

5.3.4 Can the environmental permit authority affect the detailed aims of the voluntary saving agreement?

Table 78	Yes or no	Please, specify:
Austria	-	
Denmark	No	
Finland	No	
France	No	The voluntary energy saving agreement is at branch level. An independent monitoring is conducted at branch level through emission inventories.
Germany	No	
Ireland		The Irish EPA can influence the content of the Environmental Management Programme, which may in turn influence the agreement as there is a legal requirement between the installation and the EPA.
Italy	No	See previous point.
Lithuania	-	
The Netherlands	No	As long as companies are in line with the agreement authorities are not supposed to impose other measures than those developed as part of the agreement.
Poland	No	
Portugal		Depending how (and with whom) the agreements were made. Regarding IPPC legislation, the permit can be more demanding than the agreement.
Sweden	Yes	The permit authority is not barred from imposing stricter requirements than those set out in a potential agreement. However, any interference would depend on the subject matter of the agreement in question.
The United Kingdom	Yes	If environmental regulations (i.e. IPPC) require action resulting in increased energy consumption, voluntary agreements may be revised upon application to the government.

5.3.5 Are there some specific advantages for co-ordination of voluntary energy saving agreements and the permit procedure?

Table 79	Yes or no	Please, specify:
Austria	-	
Denmark	-	
Finland		Could be. Asking in general the same data for monitoring, the companies can avoid the duplication of work when reporting to environmental authority and to Motiva (VAs).
France	Yes	It would allow for monitoring at the installation level.
Germany	No	The scales are too different for the voluntary agreement refers to the industrial branches and the permit to the single installation.

Ireland	Yes	It is important that the goals of the voluntary agreements are adopted in the permit procedure. The Irish EPA use the following condition in new permits (Question 1.1.3): 4.1. The audit shall identify all opportunities for energy use reduction and efficiency and the recommendations of the audit will be incorporated into the Schedule of Environmental Objectives and Targets under Condition 2.2 above. The Irish EPA and Irish Energy Centre have already begun to liaise closely on Energy issues. The experience gained by the Irish Energy Centre in co-ordinating the Voluntary Agreement scheme will prove very helpful to the EPA. There have been some very interesting schemes developed for the control of Energy in the Voluntary agreements and it is likely that many of these methodologies will be used in the permit procedure (i.e. evaluation of Energy reports submitted to the EPA).
Italy	No	See previous point.
Lithuania	-	
The Netherlands	No	
Poland	-	
Portugal	Yes	To the operator, since it would have to deal with few different governmental authorities and to the authorities because they could use information available under the agreement as background for the IPPC permit.
Sweden		A co-ordination could make the permit procedure less time-consuming, but legally, it seems difficult to arrange such co-ordination.
The United Kingdom		NO ANSWER

5.3.6 Are there problems in using voluntary energy saving agreements in the permit procedure?

Table 80	Yes or no	Please, specify:
Austria	-	
Denmark	Yes	They may be difficult or impossible to enforce.
Finland	No	In principle no, however, only if the Ministries agree
France		The objectives of the branch are not necessarily realistic at the installation level: some can do better, some cannot meet the objectives without major changes in industrial process.
Germany	Yes	See the answers above. The advantage is just the knowledge, that there will be energy saving even if the permit authorities put not so much concern on this issue.
Ireland		Voluntary Energy Saving Agreements are not used in the procedure at the moment.
Italy	No	Generally not.
Lithuania	-	
The Netherlands	Yes	Some authorities complain about a lack of information about the choices made as part of the agreements. They are confronted with the outcome (measures, agreed by the controlling national body of NOVEM), but have no information on the way they have been selected and the alternatives considered.
Poland	-	
Portugal		We have no experience in this area at the moment, but if the permit authority imposes stricter demands than the ones in the agreement, the operator might loose the incentive to enter in these same agreements.
Sweden	Yes	Legally binding and enforceable agreements are desirable for all parties involved. However, there must be incentives for stakeholders to conclude agreements and these incentives will be severely damaged if the permit authority can affect issues which are regulated in the agreement, i.e. impose stricter requirements. Thus, it would be desirable that the subject-matter of any voluntary agreement be of such a character that it would not become subject to the permit procedure. Notwithstanding this, any "immunity" from requirements set by permit authorities (at present or in the future) would require a strong compliance system for the agreements.
The United Kingdom		NO ANSWER

Comments:
Poland: There are no voluntary energy saving agreements in Poland

6 REPORTING AND SUPERVISION

6.1 Reporting of IPPC installations

6.1.1 Is there a monitoring and reporting system of energy use and efficiency obligatory for the operator in your country?

Table 81	Yes or no	Please, specify:
Austria	No	
Denmark	Yes	All industry - not only IPPC installations - have to report their yearly amount of energy consumption.
Finland	Yes	Energy use and not efficiency, is reported to the environmental authorities. This should be co-ordinated with the reports given to Motiva (see 5.2.5).
France	Yes	The monitoring system is about energy use. Energy efficiency is not monitored.
Germany	No	
Ireland	Yes	On new installations applying for a permit. (Question 1.1.3)
Italy	Yes	It is foreseen an obligatory system within IPPC enforcement the integrated permit will define reporting conditions for operators.
Lithuania	Yes	Reporting and monitoring system for energy use only.
The Netherlands	Yes	In case of participation in an agreement, according to the rules of the agreement. In case of no participation it depends on the conditions of the permit. In the Netherlands larger companies have report to the permitting authority on all their environmental issues they are dealing with (environmental annual report, a report based on a standard lay-out). Energy data must be part of this report. Energy data (energy use, energy efficiency quotient) obtained from the agreement can also be used for this annual report.
Poland		See 6.1.5 comment.
Portugal	Yes	Only for energy intensive consumers (DL 58/82 of 26th February and Decree (Portaria) 359/82 of 7th April.
Sweden	Yes	Each year an environment report has to be sent in to the relevant environment authority. This report must include use of resources (report on compliance with Chapter 2 section 5 of the Environmental Code).
The United Kingdom	Yes	Annual reporting of energy consumption and resulting environmental impact.

6.1.2 To whom and how often are the reports given?

Table 82	Energy authority	Environment authority	Other	Please, specify:
Austria	-	-	-	
Denmark	Yes	No	Yes	Other i.e. Statistics Denmark. Yearly.
Finland	Annually (only if there is an agreement)	Annually	No	
France	Yes	No	No	
Germany	-	-	-	
Ireland	Yes	Yes	No	Reports frequencies to the EPA are determined on a case by case basis.
Italy	No	Yes	No	Within IPPC enforcement.
Lithuania	Yes	Yes	No	Once a year.
The Netherlands				For agreements see 1.1.7. Permits depend on conditions.
Poland				See 6.1.5 comment.
Portugal	Yes	No	No	Energy intensive consumers must do a Energy Consumption and Management Plan for 5 years and report to General Directorate of Energy.
Sweden	No	Yes	No	See 6.1.1
The United Kingdom	No	Yes	No	

6.1.3 How often is the monitoring carried out?

Table 83	Monthly	Annually	In another way	Please, specify:
Austria	-	-	-	
Denmark				NO ANSWER
Finland	No	No	Yes	Varies. Motiva does annually a national summary report on the basis of the companies' annual reports.
France	No	Yes	No	
Germany	-	-	-	
Ireland	No	No	Yes	Determined on a case by case basis.
Italy	No	No	Yes	See above.
Lithuania	No	No	Yes	
The Netherlands	No	Yes	No	Depends, mostly annually.
Poland	-	-	-	See 6.1.5 comment.
Portugal	No	Yes	No	The Plan must define annual decreases in energy consumption.
Sweden				Self monitoring is most likely to give the annual situation.
The United Kingdom	No	Yes	No	

6.1.4 What parameters are monitored?

Table 84	Fuel consumption	Energy production (electricity or heat, expressed as kWh, Joules or calories)	Energy consumption (electricity or heat, expressed as kWh, Joules or calories)	Energy index (what kind of index?)	Specific energy use (expressed as kWh, Joule or calories per tonne of product)	Other	Please, specify all parameters used:
Austria	-	-	-	-	-	-	
Denmark	Yes	Yes	Yes	No	No	No	
Finland	Yes	Yes	Yes	1) Varies according to sector and company.	1) Varies according to sector and company.	No	
France	Yes	Yes	Yes	No	No	No	Fuel consumption is detailed by fuel. Energy use is detailed by energy source (electricity, vapour…) and by energy use (heating, production processes, electricity production, primary material, else)
Germany	-	-	-	-	-	-	
Ireland	Yes	Yes	Yes	Yes	Yes	Yes	The parameter used depends on the nature and type of the industry and therefore each company is examined individually. (See 1.1.3)
Italy							As in the previous point. See above.
Lithuania	Yes	Yes	Yes	No	No	No	
The Netherlands	Yes	Yes	Yes	Yes	Yes	No	Depends on agreement or permit.
Poland	-	-	-	-	-	-	See 6.1.5 comment.
Portugal	Yes	Yes	Yes	No	No	No	All units in TOE.
Sweden							Not specified.
The United Kingdom	Yes	Yes	Yes	No	No	No	

6.1.5 What information can the supervisory/permit authority get about development of energy efficiency?

Table 85	
Austria	-
Denmark	Sector analyses.
Finland	Some information is included in the companies' environmental reports. Any available information can be included in the permit application.
France	The environment authority and energy authority share local representatives. Hence, information is shared. But no institutional information sharing is organised.
Germany	The authority will ask the operators for developments of energy efficiency in their installations when supervising. Planned changes in the installations which could influence the environment (positively or negatively). Changes in energy efficiency or other issues have to be noticed to the authority.
Ireland	The Irish Energy Centre, under the Department of Public Enterprise has many publications available to the permit authority and the public on Energy Efficiency. Please see the end of this questionnaire for further information on the Irish Energy Centre and it's activities.
Italy	NO ANSWER
Lithuania	Related to permit conditions.
The Netherlands	Benchmarking: outcome of the comparison and improvement plan. MJA: measures from approved saving/reduction plans.
Poland	See comment.
Portugal	No experience in this field yet, but the IPPC authority can ask for this information to the energy authority (e.g. monitoring reports) or to the operator.
Sweden	See comment.
The United Kingdom	If an operator has a voluntary agreement, very little, as the detail is not made public. If the operator is fully regulated by the Agency then information on improvements is required.

Comments:
Austria: We have data about the total energy consumption, total energy conversion, the process situation (production of process gases etc.) and CO_2 production.

Poland: It's impossible to answer the question yet because the system of reporting is still under preparation. The Environmental Protection Law stipulates general legal basis for reporting of IPPC installations. Operators of installations are obliged to report on the levels of emissions to the competent authority. The Minister of Environment shall determine by way of a regulation specimen registers to be prepared by entities using the environment and to be employed, which will include information and data on the scope of using the environment (including, among others, data on emission values) and the way of presenting such information.
Sweden: See 6.1.1. It could e.g. be total energy use, total fossil fuel use, total electricity use, total heat production, total electricity production, total heat to district heating systems, total biofuel sold.

6.2 Supervision

6.2.1 Is there an inspection or audit system arranged by the authorities?

Table 86	
Austria	Not specifically for efficient energy use.
Denmark	Yes. An Energy Management System has been developed to be used by companies entering into an agreement with the Energy Agency (see added material).
Finland	No.
France	Yes. There is an inspection arranged by the environmental authorities under the above-quoted ministry decisions so-called "general binding rules". Environmental authorities usually demand pollutants emissions and fuel consumption detailed by fuel type every year. These elements can be cross-checked with fuel purchases, fuel stocks,…
Germany	After each issuing of a permit for a new installation or a change of an existing installation the supervising authority checks the installation. The further inspections are carried out by decision of each authority regarding the individual cases, mostly in connection with planned changes of installations, troubles with emissions, complaints of neighbours etc., sometimes combined with time-frames for inspections.
Ireland	The Irish EPA audits all its licensees at regular intervals.
Italy	See point 1.1.1

Lithuania	See 6.1.5
The Netherlands	Depend on the agreement or permit.
Poland	Chief Inspectorate for Environmental Protection is the inspection authority.
Portugal	No
Sweden	Not specifically for energy issues.
The United Kingdom	A risk-based audit system is employed by regulators.

6.2.2 How has the supervision of energy efficiency in voluntary environmental management schemes (EMAS and ISO 14001) been arranged?

Table 87	
Austria	-
Denmark	NO ANSWER
Finland	It is up to the certifier and the company, in accordance with the EMAS and ISO 14001 standards.
France	There is an audit arranged when the operator register in an environmental management scheme and an environmental submission (EMAS). At regular intervals, an environmental audit is carried out (EMS). The auditor examine the valuation, made by the operator, of energy efficiency. This is done as well for all the elements of the activities that can have an environmental impact.
Germany	EMAS: Every 3 years there is a renewed eco-audit by an expert.
Ireland	The company must submit an Annual Environmental Report which must include information as to the performance of the company in meeting it's objectives and targets set in the environmental management scheme.
Italy	It is arranged by the Certification Bodies.
Lithuania	Through audits and correction actions.
The Netherlands	In accordance with ISO or EMAS by the company. Only in case that the schemes are liked to the permit, the permit supervisor will periodically check data and measures.
Poland	It hasn't been arranged.
Portugal	It is separated and up to the certifier to do so.
Sweden	None exist.
The United Kingdom	Independent verifiers.

6.2.3 How has the supervision of energy efficiency in energy saving agreements been arranged?

Table 88	
Austria	-
Denmark	Cf. 6.1.1
Finland	The monitoring is based on the companies' annual reports. A steering committee, which has members from MoE, MTI, TT, Motiva and the companies, is following the implementation.
France	The supervision was conducted through statistics on energy at branch level, emissions inventories at national level.
Germany	See 5.2.2, 5.2.5 and 5.2.6
Ireland	The Irish Voluntary scheme is a self-audit scheme, the onus is on the company itself to take the initiative in achieving the goals of the agreement. The Irish EPA may also place requirements on the company to meet their objectives and targets under the Environmental Management Programme. New permits also have Condition 4 included (See 1.1.3).
Italy	It depends from the agreement.
Lithuania	-
The Netherlands	By the national bureau of energy saving (NOVEM).
Poland	No energy saving agreements.
Portugal	Not applicable.
Sweden	None exist.
The United Kingdom	Government-appointed verifiers.

6.2.4 How has the supervision of energy efficiency in CO_2-trading scheme been arranged (of 9.1)?

Table 89	
Austria	-
Denmark	NO ANSWER
Finland	At present, no experience.
France	The reflexion is on-going (see 9. CO_2-trading scheme).
Germany	./.
Ireland	Not applicable.
Italy	See 9.1.1
Lithuania	-
The Netherlands	Not applicable.
Poland	No CO_2 trading scheme.
Portugal	No CO_2 trading scheme in place yet.
Sweden	None exist.
The United Kingdom	Government-appointed verifiers.

6.2.5 What are the consequences if the saving measures are not fulfilled?

Table 90	6.2.5.1 In permit procedure?	6.2.5.2 In voluntary environmental schemes (EMS)?	6.2.5.3 In energy saving agreements?	6.2.5.4 In trading scheme?
Austria	-	-	-	-
Denmark	-	-	Grants are withdrawn and tax reductions must be reimbursed to the Govemment.	-
Finland	At present, no experience.	In accordance with ISO 14000 and EMAS rules.	The company can be suspended from the agreement.	At present, no experience.
France	The conditions of the permit can be reconsidered. The environment inspector can demand the respect of the environmental permit. The inspector can impose administrative penalties.	The operator establishes objectives and targets concerning energy saving if he considers that the environmental impact associated is significant for its activity. If the saving measures proposed in his environmental program are not fulfilled, a non-conformity could be issued by the organism in charge of environmental audit.	None, except for public non-compliance.	Reflexion on-going.
Germany	Measures have to be fulfilled. If not, the Company has to pay a fine if she is responsible and culpable and/or the authority can shut down the installation.	The company is given a time to fulfil. If not the label “eco-audited“ will be deprived	See 5.2.7	Not applicable
Ireland	The installation may receive non-compliance notification, which may lead to prosecution.	Not applicable	None, it is up to the company to participate willingly in the scheme. However, the lack of interest from a facility may be regarded as very poor publicity for an organisation.	Not applicable

Italy	?	Withdrawn of the EMS	Depends from the agreement	See above
Lithuania	Order of inspector to fulfil the requirements of permit.	See 6.2.2.	No	-
The Netherlands	Enforcement	Nothing, unless they are incorporated in the permit	If MJA-companies fail to comply with their own plans NOVEM informs the permit authority who them will adapt the permit (in case the measures we not incorporated yet) or enforce (if measures where already incorporated in the permit)	Not applicable
Poland	-	-	-	-
Portugal	There are no specific consequences for energy saving measures. The consequences for not fulfilment the measures that are part of the permit (thus including energy saving ones) include monetary penalties, suspension of subsidies/loans given by the state, apprehension of equipment, suspension of any other permits and eventually shutdown of the installation DL 194/2000 21st August).	In accordance to ISO 14001 and EMAS rules.	-	Not applicable.
Sweden	If saving measures or other energy issues are deemed insufficient, no permit will be given. This is the case also if the description of energy issues and saving measures in the environmental impact assessment is insufficient. In practice, the applicant is ordered to supplement his application and EIA. Only if the applicant is unable to do so to the satisfaction of the permit authority, the authority will deny him the permit.			
The United Kingdom	Enforcement according to statutory powers.	None for IPPC.	Non-certification, full rate of energy tax applied and full site-specific regulation under IPPC due to breach of permit condition to hold a certificate.	Penalties under development, but may consist of reduction in allowable releases, non-payment of financial incentive and full site specific regulation under IPPC due to breach of permit condition to meet trading requirements.

General answer:
Sweden: Non-compliance with permit conditions is prosecuted and the supervisory authority may order the operator to take measures to comply.

7 ACCESS TO INFORMATION AND PUBLIC PARTICIPATION

7.1 General questions about access to information

7.1.1 Are there any problems concerning access to information and energy efficiency e.g. confidential data (Article 15 of the IPPC directive)?

Table 91	Yes or no	Please, specify:
Austria	-	
Denmark	No	
Finland	Yes	In some sectors, the data regarding energy efficiency may disclose confidential information about techniques used and profitability. For the permitting authority this should not be a problem, as they have the right to ask for confidential data; however, in routine reporting, it still may be a problem in some sectors or for some companies.
France	Yes	Some data about energy consumption are considered as confidential.
Germany	Yes	Discussions with companies about information for BREFs show, that exact energy figures for installations are oftentimes declared as confidential. That means the public has no right to get the data unless the authority is able to prove, that the data are not known only to a few authorised personnel of the company and for causes of damage (legal definition of confidentiality).
Ireland	No	Very rarely. Sometimes installations may wish to keep product information confidential. Applications for permits in Ireland are available to the public at a number of locations, depending on the location of the activity.
Italy	Yes	It is foreseen there will be some problems by industries for the aspects related with industrial propritary information (secret).
Lithuania	No	
The Netherlands	Yes	In case of voluntary agreements authorities often do not have sufficient information to follow the process of analysing the energy situation and selection of measures.
Poland	-	
Portugal	No	
Sweden	No	Under Swedish law, all documents in the hands of authorities and the like are public unless otherwise decided in accordance with specific criteria laid down by law.
The United Kingdom	Yes	Some operators claim commercial confidentiality for information which may disclose their production figures (e.g. if required to provide specific energy consumption AND energy consumption).

7.1.2 Does the Aarhus convention (UN/ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, ECE/CEP/43) necessitate any changes in your legislation concerning the publicity of energy efficiency issues?

Table 92	Yes or no	Please, specify:
Austria	Yes	Changes will be necessary, but not specifically relating to energy efficiency issues (NGOs have to be included in the definition of the public concerned).
Denmark	No	
Finland	No	
France	No	The legislative framework pre-existed.
Germany	Yes	Changes to existing environmental laws (see 1.1.1) e.g. BImschG ,Art. 27(3): translated: "The data of the emission report have to be made known to third parties on request"; BImschG Art. 31: translated: "The public has access to the data on the monitoring of emissions which are in hand of the authority.".
Ireland		NO ANSWER
Italy		No for IPPC activities. For different activities minor changes could be possible.
Lithuania	No	
The Netherlands		No traceable need.
Poland	No	Polish legislation is already in compliance with Aarhus Convention. The procedure of ratifying the Convention is in the final stage.
Portugal	No	

Sweden	No	As mentioned under 7.1.1 all documents held by authorities are available for the public. There is legislation under which documents may be declared confidential, but it will not be affected by the Convention. Possibly, time limits for authorities to produce the requested documents may have to be introduced in the Freedom of Press Act.
The United Kingdom		NO ANSWER

Comments:
Poland: It's impossible to discuss the problems when we haven't implemented IPPC yet.

7.2 Access to information in the permit procedure and supervision

7.2.1 How is it ensured that data relating to energy efficiency are made public during the permit procedure according to your legislation?

Table 93	
Austria	We have a general binding rule (for IPPC-installations: e.g. Section 77a (5) of the Trade and Industry Act, Section 121 (5) of the Mining Code).
Denmark	There is a public hearing where all parts of the application and the permit are announced.
Finland	The mandate of the permitting bodies ensures it.
France	Generally, all documents related to the permit procedure are made public except for those that can violate industrial secret.
Germany	The planning application and the documents as a whole on new installations and substantial changes of existing installations is available to the public for a period of one month after publishing a notice.
Ireland	All application details are available on the public file and may be inspected in EPA Headquarters at any time during normal operation. The public may also make a submission to the EPA regarding any issue at an installation or any issue in the application for a permit. Submissions may of course include concerns regarding energy usage and efficiency at an installation.
Italy	Dissemination through the press of information regarding the place where documents Are available for the public.
Lithuania	Permits are available to public.
The Netherlands	Publication of the permit application is compulsory by law.
Poland	There are no specific rules for making energy efficiency data available to public in the permit procedure. In the Environmental Protection Law there is obligation for making applications for integrated permits and integrated permits available to the public.
Portugal	The application form and all the documents are made public during 15 to 30 days at Regional Directorates of Environment (DRAOT), depending if the unit had had a previous Environmental Impact Assessment or not. Preceding that a notice is posted at municipalities where the unit is sit (or is going to sit), on a newspaper and at the DRAOT installations.
Sweden	All relevant data are public as soon as the permit authority receives them and any oral proceedings are accessible to the public. There are limited possibilities to declare documents confidential.
The United Kingdom	Information placed on public registers.

7.2.2 Are there any limitations (confidentiality clauses) in your legislation on making these data public?

Table 94	Yes or no	Please, specify:
Austria	Yes	Business secrets have to be respected, e.g. Sec. 77a (5) Trade and Industry Act. (see also Environmental Information Act, Fed. Law Gaz. No. 495/1993 as amended by Fed. Law Gaz. I No. 108/2001, Sec. 4; for "environmental data").
Denmark	Yes	We have confidentiality clauses similar to the clause in the Aarhus Convention.
Finland	Yes	Act on the Openness of Government Activities (621/1999).
France	Yes	There are limitations that prevent from making energetic data public. The ACT No. 78-753 of 17 July 1978 (loi n°78-753 du 17 juillet 1978 portant diverses mesures d'amélioration des relations entre l'administration et le public et diverses dispositions d'ordre administrative, social et fiscal, modifiée par la loi n°79-587 du 11 juillet 1979 et par la loi n°2000-321 du 12 avril 2000 available at www.cada.fr) points that industrial confidentiality must be preserved.

		This is consistent with the Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment (available at http://europa.eu.int/eur-lex/en/lif/dat/1990/en_390L0313.html). As for interpretation of "commercial and industrial confidentiality", energy authority won't publish any result on energy consumption if the number of operators is below 3 or one operator represents 70 % (I do not possess the legal basis of such a rule).
Germany	Yes	The part of the application documents which the applicant declares confidential have to be brought in separately for information of the authority and are not available to the public. The authority has to check on the base of German general administration law if the documents are correctly declared as confidential. A generalised description of the confidential data is available to the public.
Ireland	No	
Italy	Yes	Industrial secret (licences) legislation, public safety, national defence, crime prevention and private or third part confidentiality.
Lithuania	Yes	There are some provisions on confidentiality set in Lithuanian legislation, but these limitations do not cover data on environmental issues.
The Netherlands	Yes	The law offers the possibility to handle certain information confidential if the authority agrees to do so.
Poland		See 7.2.1
Portugal	Yes	Only when commercial or industrial confidential processes or products are involved.
Sweden	No	There is no specific reference to energy data. However, under the Secrecy Act (SFS 1980:100) it is possible to declare data which pertain to e.g. business activities, research or inventions of individuals confidential under certain circumstances.
The United Kingdom	Yes	Operators may apply to withhold information from public register on grounds of commercial sensitivity and other reasons.

7.2.3 Is data in the application and monitoring data concerning energy efficiency

Table 95	Always made public	Never made public	Can be declared as confidential	Can be declared only partly as confidential	Please, specify:
Austria	-	-	x	-	See 7.2.2 /Exception: The applicant can make them public voluntarily.
Denmark	-	-	x	-	We have confidentiality clauses similar to the clause in the Aarhus Convention.
Finland	-	-	-	x	The application is publicly available. However, the authority can also in addition, request some confidential data, which is not made available to the public (e.g. concerning chemicals or energy).
France	x	-	-	-	The data on energy consumption and production are made public every year in national energy statistics at NCE 93 level. Nevertheless, if companies are not numerous, some data cannot be public according to the law on duties, coordination and confidentiality in statistics. The law applies automatically on publicity, but industries have to declare.
Germany	-	-	x	x	That depends on the data. See 7.2.2.
Ireland	x	-	-	-	
Italy	x	-	-	-	Yes. Data should be always made public with the exceptions of 7.2.2.
Lithuania	x	-	-	-	
The Netherlands	-	-	x	-	If the applicant has good reasons (mostly protection of company secrets).
Poland					See 7.2.1

Portugal	x	-	-	-	Data in the application is always made public during the period of public consultation (all that permit application is made public). Monitoring data is made public by DRAOT.
Sweden					See above.
The United Kingdom	-	-	x	-	Some parts may be confidential.

7.2.4 What kind of data can be declared as confidential?

Table 96	All energy data	Energy production	Energy consumption (used fuel, heat or electricity)	Energy index	Specific energy use	Other	Please, specify:
Austria	Yes	No	No	No	No	No	
Denmark	-	-	-	-	-	-	We have confidentiality clauses similar to the clause in the Aarhus Convention.
Finland	No	No	No	No	Yes	No	
France	Yes	No	No	No	No	No	Any data can become confidential provided the number of company is lower than 3 or the company represents more than 70 % of the figure.
Germany	No	Yes	No	Yes	Yes	Yes	Only data that refer to the general definitions on confidentiality in German administration law.
Ireland	-	-	-	-	-	-	It is difficult to answer this question as the issues are often site specific.
Italy	-	-	-	-	-	-	See point 7.2.2.
Lithuania	No	No	No	No	Yes	No	
The Netherlands	Yes	No	No	No	No	No	In practise specific data are more likely to be declared confidential the general data.
Poland	-	-	-	-	-	-	See 7.2.1.
Portugal							Only the one referred in 7.2.2.
Sweden							If the requirements of Swedish confidentiality legislation are met, data can be declared confidential by the authority, which possesses the data (see further 7.2.1 above).
The United Kingdom	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	Whichever is specified by the operator as commercially confidential.

7.2.5 Are there any difficulties on making energy efficiency data available to the public in the permit procedure and supervision?

Table 97	Yes or no	If yes please, specify:
Austria	-	
Denmark	No	We have confidentiality clauses similar to the clause in the Aarhus Convention. We have only rare examples of companies claiming that their data or part of them are confidential.
Finland	Yes	See above.
France	Yes, theoretically	The article 2-4° of the decree (décret n°77-1133 du 21 septembre 1977) that states which documents must be transmitted by the future operator has a restriction on availability for the public of information that compromises fabrication secrets: "(…) *Le cas, échéant, le demandeur pourra adresser en exemplaire unique et sous pli séparé, les informations dont la diffusion lui apparaît de nature à entraîner la divulgation des secrets de fabrication*".
Germany	Yes	There could be discussions between the authority and the applicant whether a data is to be taken as confidential or not. It could be difficult for the authority to show that e.g. data are already known to the public or that publishing data could do no harm to the company e.g. if competitors get to know.

Ireland	No	
Italy		See point 7.1.1.
Lithuania	No	
The Netherlands	Yes	Applicants can demand that sensitive data are not made public.
Poland	-	See 7.2.1
Portugal		Only if data is considered confidential.
Sweden	No	
The United Kingdom		NO ANSWER

7.3 Openness in voluntary measures

7.3.1 Are the data concerning energy efficiency in EMAS made public?

Table 98	Totally	In part	Never	Please, specify:
Austria	-	x	-	The installations make public an annual environmental report including the energy situation of the installation.
Denmark	-	x	-	If they are part of the yearly EMAS environmental statement.
Finland	-	x	-	The environmental statements are not very detailed and most of them show trends in total figures such as kWh/a or fuel consumption.
France	-	x	-	The operator is free to consider some data confidential.
Germany	-	x	-	Aggregated data are published e.g. total energy consumption of a site or specific energy consumption per ton of all (e.g. 3) products of an installation.
Ireland	-	x	-	A summary of the installation's performance is generally available to the public. The EPA in the permitting process may ask for further back-up material, all of which would generally be available to the public.
Italy	x	-	-	It is regulated by the EMAS itself.
Lithuania	x	-	-	
The Netherlands	-	x	-	If incorporated in the annual report for the public.
Poland				See 7.3.2
Portugal	-	x	-	The installation final Environmental Statement refers its total energy efficiency.
Sweden	x	-	-	See Art. 5.2 (c) of the EMAS regulation.
The United Kingdom				Not known.

7.3.2 Are the data concerning energy efficiency in ISO 14001 made public?

Table 99	Totally	In part	Never	Please, specify:
Austria	-	-	-	
Denmark	-	-	x	It is not a requirement in ISO 14001.
Finland	-	x	-	Voluntarily made environmental reports are similar to that of the EMAS reports (this assumption may be a possible topic for research).
France	-	x	-	The operator has to record his decision to make public or not some information about significant environmental aspects. The data concerning energy efficiency can be part of those elements.
Germany	-	-	-	Usually not, sometimes it could be mentioned in articles for newspapers or journals
Ireland	-	x	-	Same as above.
Italy				Generally yes, but not regulated.
Lithuania	x	-	-	
The Netherlands	-	x	-	If incorporated in the annual report for the public.
Poland				Depending on the system. If energy efficiency is defined as one of the fundamental issue, the data on it can be made public.
Portugal	-	x	-	If the company decides to make it public.
Sweden				That is up to the individual company.
The United Kingdom				Not known.

7.3.3 Are the data concerning energy efficiency in energy saving agreements at branch or company level made public?

Table 100	Totally	In part	Never	Please, specify:
Austria				We have no experience, but in our legislation there is no statutory bar to do this.
Denmark	-	x	-	All data are anonymised and/or aggregated according to the rules laid on Statistics Denmark.
Finland	-	x	-	Not at branch or company level, only data published in the public annual report by Motiva.
France	x	-	-	The data are available on the web site of the ministry of environment at branch level.
Germany	-	x	-	At branch level. Data mainly include figures for CO_2-reduction.
Ireland	-	x	-	
Italy	x	-	-	It depends from the agreement. There are not experiences on restrictions at the moment
Lithuania				
The Netherlands	-	x	-	If incorporated in the annual report for the public.
Poland				There are no energy saving agreements.
Portugal				Not applicable.
Sweden				None exist, but if they did, they would be made public.
The United Kingdom	-	-	x	

7.3.4 Are the data concerning energy efficiency for individual installations in energy saving agreements made public?

Table 101	Totally	In part	Never	Please, specify:
Austria	-	x	-	It needs the general agreement of the applicants.
Denmark	-	-	x	Sometimes individual data are made public in agreement with the company.
Finland	-	-	x	
France	-	-	-	The energy saving agreements were not concluded at installation level.
Germany	-	x	-	Sometimes, outstanding measure are mentioned as examples.
Ireland	-	x	-	
Italy	x	-	-	See previous point.
Lithuania	-	-	-	
The Netherlands	-	x	-	If incorporated in the annual report for the public.
Poland	-	-	-	There are no energy saving agreements.
Portugal	-	-	x	Not applicable.
Sweden	-	-	-	None exist, but if they did, they would be made public.
The United Kingdom	-	-	x	

7.3.5 Are there any problems concerning openness in voluntary measures?

Table 102	Yes or no	Please, specify:
Austria	-	We have no experience.
Denmark	Yes	Considerations on confidentiality issues.
Finland	(Yes)	Not known, might be.
France	Yes	There can be problems of confidentiality.
Germany	No	
Ireland	Yes	Companies may be less forthcoming in voluntary measures as they may not get asked to supply as detailed information as they may need to supply in the permitting process.
Italy	No	See above.
Lithuania	-	
The Netherlands	-	Not different from other approaches.
Poland	-	There are no energy saving agreements.

Portugal	-	
Sweden	-	None exist, but if they did, they would be made public.
The United Kingdom		NO ANSWER

8 ENERGY TAXES

8.1 General questions

8.1.1 Do you have energy taxes?

Table 103	Yes or no	Please, specify:
Austria	Yes	Gasoline unleaded 408 €/1000 l, gasoil 283 €/1000 l, light fuel oil for households 69 €/1000 l, heavy fuel oil 36 €/t, natural gas 44 €/1000 m^3, electricity 15 €/MWh.
Denmark	Yes	
Finland	Yes	Finland has indirect energy taxes.
France	Yes	France has taxes on energy. They are not specifically meant for environmental purposes even if they contribute to improve energy efficiency.
Germany	Yes	Electric power suppliers have to pay 20 DM/MWh. For producing or agricultural branches it is 4 DM for the amount exceeding 50 MWh. There is a total exemption for power generated in windmills or by sun or biological processes with less than 5 MW per installation. For power intensive installations is the energy tax refunded for the amount exceeding 50 MWh if the tax exceeds 120 % of the reduction of the employers contribution to the German national pension fund (the contributions are lowered in connection with the increase in energy taxes). For producing or agricultural companies tax for fuel is refunded if the tax exceeds 1 000 DM per year and 120 % of the reduction of the employers contribution to the German national pension fund.
Ireland	No	
Italy	Yes	
Lithuania	Yes	
The Netherlands	Yes	Regular Energy Tax (REB) and General Fuel Tax (BSB) and Exics on motor fuel
Poland	No	
Portugal	Yes	VAT on electricity and natural gas and tax on fuel – these taxes were not created with environmental purposes.
Sweden	Yes	Please see below.
The United Kingdom	Yes	

8.1.2 What is taxed?

Table 104	CO_2	Oil	Petrol	Fuel	Electricity	Other	Please, specify:
Austria	No	Yes	Yes	Yes	Yes	Yes	
Denmark	Yes	Yes	Yes	Yes	Yes	No	CO2 and all fuels except renewable.
Finland	Yes	Yes	Yes	Yes	Yes	No	CO2 for heat consumption. Electricity for the consumers is taxed.
France	No	Yes	Yes	Yes	Yes	Yes	Gas
Germany	No	No	Yes	Yes	Yes	Yes	Gas, coal.
Ireland	-	-	-	-	-	-	There is a tax, when buying oil, petrol, fuel or electricity but it is not an "energy tax".
Italy	Yes	Yes	No	Yes	Yes	No	
Lithuania	No	Yes	Yes	Yes	Yes	No	
The Netherlands	Yes	Yes	Yes	Yes	Yes	Yes, natural gas	REB and BSB are on the basis of 50 % CO2 and 50 % energy content.
Poland	-	-	-	-	-	-	
Portugal	No	Yes	Yes	Yes	Yes	Yes	Gas
Sweden	Yes	No	Yes	No	QUESTION MISSING	No	"Oil" and "Fuel" is quite unclear, diesel oil is energy taxed. In addition, there is VAT on all types of goods and services.

The United Kingdom	No	No	Yes	Yes	Yes	Yes	Coal

8.1.3 Are the energy taxes applicable to every installation (IPPC installations and other)?

Table 105	Yes or no	Please, specify:
Austria	Yes	
Denmark	Yes	
Finland	Yes	
France	Yes	Taxes are connected to the nature and the amount on energy. Hence, they apply independently of the nature of installation, IPPC or not.
Germany	Yes	But tax for fuel used in installations for co-generation of power and heat is refunded if usable energy rate by year is at least 70 %.
Ireland		Not applicable
Italy	No	
Lithuania	Yes	
The Netherlands	Yes	They are applicable to every installation, but with a maximum per plant of 1 million m3 gas and 10 million kWh per annum.
Poland	-	
Portugal	Yes	
Sweden		QUESTION MISSING
The United Kingdom	No	Exemptions are power generation, primary fuel to refineries, chlor alkali and aluminium smelting.

8.2 Connections to other systems

8.2.1 Are there connections between energy taxes and/or voluntary agreements and/or energy audits in your country?

Table 106	Yes or no	Please, specify:
Austria	No	
Denmark	Yes	Connections between energy taxes and voluntary agreements – see above section 5.
Finland	No	
France	No	At the moment, there is no connection between these. But there is an ongoing reflexion about connection voluntary agreements and energy audits.
Germany	No	
Ireland		Not applicable.
Italy	No	
Lithuania		Not identified.
The Netherlands	No	The exception is an agreement with the glasshouse (horticulture) about a mitigated rate for REB.
Poland	No	
Portugal	No	
Sweden	No	None exists, but a linkage is discussed for possible future voluntary agreements.
The United Kingdom	Yes	80 % discount on tax may be obtained of entering into a voluntary agreement.

8.2.2 Are there direct connections between energy taxes and permit procedure?

Table 107	Yes or no	Please, specify:
Austria	No	
Denmark	No	
Finland	No	
France	No	As written above, energy taxes are independent of the nature of installation.
Germany	No	
Ireland		Not applicable.
Italy	No	
Lithuania	No	
The Netherlands	No	
Poland	-	

Portugal	No	
Sweden	No	
The United Kingdom	No	

8.2.3 Are there any problems in connections between energy taxes, voluntary agreements and permit procedure?

Table 108	Yes or no	Please, specify:
Austria		We have no experience.
Denmark	No	
Finland		NO ANSWER
France	Yes	There might be constitutional problems in breaking taxes equality of industries.
Germany	Yes	These are very different instruments. The reference is not the single installation as is in IPPC. The energy tax (and perhaps the voluntary agreement too) probably will be the engine in the process to achieve energy efficiency. The permit procedure will be a corrective on limited measures in the installations.
Ireland		Not applicable.
Italy	No	
Lithuania		No experience.
The Netherlands		Not applicable.
Poland	-	
Portugal		No experience so far. There might be some problems since the taxes are not created for environmental purposes.
Sweden		None exists, but problems between voluntary agreements and permit procedures could arise. For example, striking a balance between measures required by the IPPC directive, which aim to secure the best possible result for the environment as a whole and the more limited scope of the voluntary agreements. Another example is the (potential) lack of participation of the public in concluding such agreements. A third potential problem is the competence of the permit authority in relation to the agreement, to which extent should the permit authority be bound by the agreement or should it be able to impose stricter requirements.
The United Kingdom	No	

8.2.4 Are there some advantages in connections between energy taxes, voluntary agreements and permit procedure?

Table 109	Yes or no	Please, specify:
Austria		We have no experience.
Denmark		The Danish system has not considered such advantages. Maybe because the scheme for making agreements on energy saving is limited in time and will expire in a few years.
Finland		Could be.
France	Yes	As written above, energy taxes are often used to promote voluntary agreements. There are advantages in connecting voluntary agreements and permit procedure, for example to provide monitoring of energy efficiency.
Germany	No	
Ireland		Not applicable.
Italy	No	
Lithuania		No experience.
The Netherlands		Not applicable.
Poland	-	
Portugal	Yes	Probably taxes can be an incentive to promote agreements that will help to comply with the permits.
Sweden	Yes	The connection between energy taxes and voluntary agreements is beneficial since taxes provide one important incentive to conclude agreements. Apart from this example, it seems as if the three should be kept as separate as possible on the level of implementation and enforcement. However, we cannot advice exhaustively on this point since experience is limited and background material sparse.
The United Kingdom		NO ANSWER

9 TRADING SCHEME

9.1 CO_2 trading scheme

9.1.1 Are you using a CO_2 trading scheme in your country?

Table 110	Yes or no	Please, specify:
Austria	No	
Denmark	Yes	For power plants. Legal duration 2000-2003, presumed prolongation.
Finland	No	
France	No	A reflexion about CO2 trading scheme is ongoing in France at the moment, fully linked with the European directive.
Germany	No	
Ireland	No	
Italy	No	
Lithuania	No	
The Netherlands	No	
Poland	No	
Portugal	No	
Sweden	No	
The United Kingdom	No	

9.1.2 Do you have plans for using a CO_2 trading scheme in the short run?

Table 111	Yes or no	Please, specify:
Austria	No	Greenhouse gas emission allowance trading within the European Community from 2005.
Denmark	-	
Finland	No	The development of an EU trading scheme is followed up.
France	No	If is not feasible in the short run (see below).
Germany		The proposal of the EU commission from May 2001 is just now in discussion.
Ireland	No	
Italy	No	
Lithuania		Not identified.
The Netherlands	Yes	The possibilities for the development of a national scheme is presently being studied.
Poland	No	
Portugal	No	Not prior to the development of an EU trading scheme.
Sweden	No	A committee has investigated the issue (spring 2000). It is recommended that Sweden take no unilateral action, but wait for an EU trading scheme.
The United Kingdom	Yes	From April 2002.

9.1.3 If you have tradable emission quotas in use or are planning to use them, how is it taken into account in the permitting procedure? Are there e.g. minimum requirements that all IPPC installations have to fulfil?

Table 112	
Austria	-
Denmark	No connection to the permitting procedure. The plants involved are mentioned by name in the Act on tradable CO2 emission quotas.
Finland	There are no national plans.
France	-
Germany	Discussions on future emission trading show that it would be not be allowed to miss the BAT, so there will be minimum requirements on energy efficiency measures in each installation.
Ireland	-
Italy	There are not provisions.
Lithuania	We have no.
The Netherlands	No tradable emission quotas yet in use (see 9.1.1). The study for using them, has not made clear yet what the answer to your questions will be .

Poland	-
Portugal	No tradable emission quotas in use or planned for at the moment.
Sweden	-
The United Kingdom	Same applies as for voluntary agreements.

9.1.4 The European Union is preparing itself for an EU wide CO_2 trading scheme covering some of the most energy intensive IPPC sectors. Does this affect current plans regarding permitting in your country?

Table 113	
Austria	Not in general, adaptations could be necessary.
Denmark	Yes, it does effect Danish plans, Denmark is interested in a EU CO2 system, however the sectors proposed are different and may cause complications, moreover the new Danish law on tradable CO2 quotas will have to be modified.
Finland	Yes, it could affect.
France	-
Germany	Not now, the legal basis of such a trading scheme would still have to be created by law.
Ireland	NO ANSWER
Italy	None
Lithuania	Yes, after accession.
The Netherlands	Most probable, but surmountable.
Poland	-
Portugal	No
Sweden	This could mean that the question of CO2 emissions would have to be separated from the integrated permit procedure, which would mean that the law on integrated permitting would have to be altered. However, this is not a unique Swedish problem since any country applying the IPPC directive will face the same question.
The United Kingdom	Yes

9.1.5 Is it legally possible to introduce a CO_2 trading scheme in your country?

Table 114	
Austria	The legal basis will be introduced after adoption of the EC Directive.
Denmark	Yes
Finland	Yes
France	A detailed analysis was conducted on the feasibility. It is not possible under the present legislation as it would demand to modify the environment code.
Germany	Not now. It needs legislation.
Ireland	NO ANSWER
Italy	Yes, there are no restrictions.
Lithuania	While EU wide CO2 trading scheme is not prepared, it is complicated to answer to this question.
The Netherlands	This is in study. No clear answer yet.
Poland	No
Portugal	Yes, if there is an EU directive to do so.
Sweden	There has been some debate as to whether revoking an existing permit would amount to expropriation. The issue is not finally settled, but we are inclined to believe that it will be legally possible to introduce a CO2 trading scheme. (For other issues see 9.1.4).
The United Kingdom	Yes

10 FINAL QUESTIONS

In your opinion, what are the main problems with efficient energy use in the environmental permit procedure?

Table 115	
Austria	Energy efficiency is one issue in the permitting procedure. On the contrary to the fixing of ELVs for air or water pollutants energy efficiency can not easily be connected with a “protected interest” (Schutzgut). E.g. there are immission limit values for air quality which must not be ex-

	ceeded. A comparable standard does not exist for the effects of insufficient energy efficiency. In practice it will be hardly feasible to refuse a permit because of poor energy efficiency.
Denmark	In most cases it is not possible to set up enforceable conditions for energy efficiency in a permit for an individual company.
Finland	At the present time, there are no intentions to include efficiency as kWh/tonnes produced in the permit conditions. The knowledge in this field is still insufficient among authorities.
France	Confidentiality of data on energy and energy efficiency if industrial secret, insufficient reference on energy efficiency, insufficient workforce to perform the task.
Germany	The main problem is the complexity of the energy use and the energy flow in the sites, that are mostly composed of a lot of different installations. That means, that it could be difficult to find out measures to meet by all installations of the same kind. An other problem is, that applicants argue, that they have done enough for energy efficiency in the last few years because of the high price level, the taxation, EMAS and other requirements in Germany. So they would try to avoid any obligations exceeding a general declaration in the application documents.
Ireland	It is difficult to comment yet as installations are just beginning to grasp this concept. It is important that energy usage in a permitted installation be benchmarked so as to have a means by which continual improvement can be measured.
Italy	NO ANSWER
Lithuania	To prioritise the efficient energy use options in company level.
The Netherlands	The economic aspects plays a much more dominant role, than in other environmental fields and they are often difficult to judge by the authorities.
Poland	Difficulties with assessing of energy efficiency, with defining what is or what isn't energy efficient, lack of references, lack of inspection methods.
Portugal	The difficulty to combine energy efficiency issues with other environmental considerations (trade-offs) and the difficulty in establishing a good benchmark to be used as an energy efficiency target, since all the installations have differences (age, lay-out, process, etc.). Finally, there is room further co-operation between environment authorities and energy authorities, that traditionally work separately. However, we have not much experience in this yet and thus, there might be some more problems that are not perceived a the moment.
Sweden	Energy issues are very complex. Highly experienced people would be required for assessment and evaluation. Industry is likely to have such people, whereas authorities, including the permitting bodies, may not always be able to produce or recruit such competence.
The United Kingdom	Linking regulatory requirements with non-regulatory schemes.

How would you rate these problems?

Table 116	Very serious	Serious	Not so serious	Please, specify:
Austria	-	x	-	
Denmark	x	-	-	
Finland	-	x	-	
France	-	x	-	Together with carbon dioxide, a number of pollutants (SOx, NOx, PM,…) are emitted. Therefore, every effort made on CO2 emissions is a potential gain for those other pollutants.
Germany	-	x	-	This is an issue in the permitting procedure which is formerly dealt with "spotwise" in single cases, not in this breadth and depth which it needs now.
Ireland	-	-	x	
Italy				NO ANSWER
Lithuania	-	x	-	
The Netherlands	-	x	-	
Poland	-	x	-	See above.
Portugal	-	x	-	
Sweden	-	x	-	The permit procedure might be unbalanced.
The United Kingdom	-	-	x	The main issue is to avoid double regulation.

In your opinion, what suggestions are there for further development of efficient energy use in the environmental permit procedure?

Table 117	
Austria	Developing a common horizontal BREF with principles on the efficient use of energy. Sector

	specific BREFs should focus more on energy efficiency and provide techniques and associated energy data. A main issue should be how an existing plant could be more energy efficient. A guidance how authorities should deal with the requirement of energy efficiency in the permit and when inspecting installations would be appreciated.
Denmark	More discussions and knowledge on the issue e.g in the BREFs in order to develop enforceable conditions for energy efficiency in an individual permit.
Finland	A variety of policy instruments and their combinations should be investigated. Co-operation with Motiva could be intensified (e. g. with regard to reporting and education). The information in BREFs should be developed.
France	Reporting format, reference about energy efficiency available.
Germany	Because of that complexity it would be necessary to fix principles, a bundle of measures on energy efficiency and examples of existing measures that should be taken into account when permitting. That would be a goal for the development of the BREF. The permitting authority has probably to force the applicant to deliver sufficient documents. This would be much easier if there would be some guidelines.
Ireland	It is important that all installations have their energy requirements benchmarked so that a schedule of objectives and targets for energy reduction can be set up. An enforcement programme should be set up to determine whether or not the installation is meeting its targets.
Italy	NO ANSWER
Lithuania	To develop criteria on selection of the best options on efficient energy use in different branches of industry.
The Netherlands	CO2-tradingschemes and financial incentives will be more helpful than the present BAT/permit approach.
Poland	NO ANSWER
Portugal	Improve the BREFs, develop benchmarking and formally start co-operation with energy authorities.
Sweden	Discussion within IMPEL between permit writers on different options to regulate the issues in permits.
The United Kingdom	More information, in a consistent format, provided in BREF documents.

Further comments on this questionnaire:

Table 118

Austria	The future importance of considerations relating to energy efficiency will depend on the further developments in connection with the EC directive on greenhouse gas emission allowance trading within the European Community. It seems as if energy efficiency will soon be no more a permit condition for the majority of IPPC installations.
Denmark	-
Finland	There were too many questions, partly overlapping, partly including self-evident answers. This questionnaire may allow for the opportunity to check inconsistencies with the answers. As well, there were too little technical questions, which could have been beneficial in the better understanding in the concepts of efficiency. Thus it could have supported the BAT work currently done in Seville.
France	Answering this questionnaire was quite difficult: • the questionnaire whilst very complete and interesting appeared a bit long, • the details asked in the questionnaire required to collect information from various people (here: 10), • the English language made self-administration of the questionnaire difficult, • a glossary would be necessary for certain terms used.
Germany	NO ANSWER
Ireland	NO ANSWER
Italy	NO ANSWER
Lithuania	NO ANSWER
The Netherlands	NO ANSWER
Poland	It is too early to answer most of the questions of that questionnaire - while the system of IPPC is not implemented in Poland yet and we still don't have any practice in that field (many questions are related to practical not legal problems). It would be more reasonable to answer the questionnaire at least one year after the regulations concerning IPPC is in force and it should be fulfilled rather by permitting authorities.
Portugal	NO ANSWER
Sweden	NO ANSWER
The United Kingdom	NO ANSWER

ANNEX II: CONFIRMED AGENDA OF THE SEMINAR AND LIST OF THE PARTICIPANTS

WEDNESDAY, 6th of February

	Arrival of the participants
19.00	Finnish Midwinter Party at Finnish Environment Institute (Mechelininkatu 34 A)

THURSDAY, 7th of February, Finnish Environment Institute

Chairman for a.m. Alec Estlander, FEI

08.45	Registration
09.15	Opening and Presentation of FEI (Alec Estlander)
09.30	Presentation of the Seminar Topics (Marianne Lindström)
10.00	Viewpoints of the Ministries (Sirpa Salo-Asikainen and Pentti Puhakka)
10.30	Coffee
11.00	Energy Efficiency in the Finnish Industry (Juha Kouki)
11.30	Analyses of the Questionnaire (Elise Sahivirta, Marianne Lindström, Mikko Attila)
12.30	Lunch

Chairman for p.m. Antero Honkasalo, MoE

13.30	General Discussion of the Main Points of the Questionnaire
14.30	Coffee
15.00	Working in Groups, Session I
16.30	Presentations of Working Groups, Session I
17.30	Closing the First Day
20.00	Dinner (Restaurant Lasipalatsi, Mannerheimintie 22–24)

FRIDAY, 8th of February, Finnish Environment Institute

Chairman Antero Honkasalo, MoE

09.00	Presentation of IMPEL Network (Terence Shears)
09.20	Working in Groups, Session II
11.00	Coffee
11.30	Presentation of the Results of Working Groups, Session II
12.30	Lunch
13.30	Key Difficulties of Handling Energy Efficiency in Permits
14.30	Coffee
15.00	Suggestions for Good Practice
16.00	Conclusions and Proposals for Further Work
16.30	Closing the Seminar

PARTICIPANTS OF THE IMPEL SEMINAR IN HELSINKI 6.-8.2.2002

Updated 29.10.2002

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ANNEX III: FINNISH APPLICATION FORM FOR ENERGY EFFICIENCY

ASSESSMENT OF ENERGY EFFICIENCY

Appendix to environmental permit application

1. CONTACT INFORMATION

Name of company, type of business
Assessment of energy efficiency relates to (name and address)
Assessment of energy efficiency relates to ☐ the same activity as the environmental permit application ☐ part of the activity referred to in the environmental permit application, what?

2. ENERGY SAVING AGREEMENT AND ENVIRONMENTAL MANAGEMENT SYSTEM

Does the company have an energy saving agreement?		
☐ Yes, for the year(s)	☐ No	
Does the company have an environmental management system?		
☐ Yes, which?	☐ Planned, which, when?	☐ No
Does the environmental management system include improved energy efficiency? How?		

3. TOTAL ENERGY BALANCE

		☐ Estimated value ☐ Energy use in (year)
Electricity	purchase (MWh) sales (MWh)	
Heat	purchase (MWh) sales (MWh)	
Fuel	purchase (MWh_{pa}) sales (MWh_{pa})	

4. ENERGY GENERATION PER BOILER

Name of boiler			☐ Boiler estimated value ☐ Boiler energy generation in (year)
	Use	fuel (MWh_{pa})	
		electricity (MWh)	
	Output	electricity (MWh)	
		heat	
		- steam (MWh)	
		- hot water (MWh)	
		- other heat (MWh)	
	Use	fuel (MWh_{pa})	
		electricity (MWh)	
	Output	electricity (MWh)	
		heat	
		- steam (MWh)	
		- hot water (MWh)	
		- other heat (MWh)	
	Use	fuel (MWh_{pa})	
		electricity (MWh)	
	Output	electricity (MWh)	
		heat	
		- steam (MWh)	
		- hot w ater (MWh)	
		- other heat (MWh)	

5. ENERGY CONSUMPTION IN PROCESS PARTS

Name of process part		☐ Estimated value ☐ Process part energy consumption in (year)
	Electricity (MWh) Heat steam (MWh) hot water (MWh) other heat (MWh) Fuel (MWh_{pa})	
	Process part output (t/a or other)	
	Electricity (MWh) Heat steam (MWh) hot water (MWh) other heat (MWh) Fuel (MWh_{pa})	
	Process part output (t/a or other)	
	Electricity (MWh) Heat steam (MWh) hot water (MWh) other heat (MWh) Fuel (MWh_{pa})	
	Process part output (t/a or other)	

6. THE ENERGY EFFICIENCY ESTIMATE IS BASED ON THE FOLLOWING DOCUMENTATION

Questions for companies which have made an energy analysis or an energy review according to the MOTIVA model and with the support of the Ministry of Trade and Industry	
- process industry energy analysis, stage 1 - process industry energy analysis, supplementary stage 2 analyses (indicate name) - industrial company energy analysis - industrial company energy review	Year
Annual site reports under industrial energy saving agreement for the years	
Do the above sites correspond to the sites in the environmental permit application? ☐ Yes ☐ No	
Other reports and studies pertaining to energy use and efficiency (e.g. during the past five years)	
Energy efficiency index for the site available, reported in (year) , see appendix nr.	
Other energy efficiency estimates, please list	
Questions for companies which have not made an energy saving agreement with the Ministry of Trade and Industry nor affiliated themselves with another energy saving agreement Is there an official responsible for energy issues? ☐ Yes, who ☐ No	
Has a decision been made on a MOTIVA energy review or analysis? ☐ Yes, for the year ☐ No	

7. STEPS TAKEN DURING THE LAST THREE YEARS TO IMPROVE ENERGY EFFICIENCY

(step, implementation time, estimated energy saving, investment) ☐ more information in appendix nr.

8. PLANNED STEPS TO IMPROVE ENERGY SAVING

(step, implementation time, estimated energy saving, investment)

☐ more information in appendix nr.

9. PLANNED ENVIRONMENTAL PROTECTION INVESTMENTS

(step, implementation time, estimated effect on energy use, investment)

☐ more information in appendix nr.

10. COMPANY'S OR COMPANY REPRESENTATIVE'S ASSESSMENT OF ENERGY EFFICIENCY

☐ more information in appendix nr.

11. SIGNATURES

Place	Date
Assessor's signature	Contact information
Signature in block letters	

ANNEX IV: TECHNICAL POSSIBILITIES TO ACHIEVE MORE ENERGY EFFICIENCY

IV.1 BACKGROUND

This summary will give some answers and suggestions about what is possible and ways to aim at this target. In no way though are these the only possibilities. As an introduction there is a brief overview of the present energy use in the EU, based on information from Energy and Environment in the European Union (2002).

Users of energy can be divided into three groups: manufacturing and power supply, household and services (having a similar structure of energy use) and traffic. It can be said that all "users" have nearly the same ratio of total energy consumption. Here only the manufacturing and power supply sector is described as those installations need an environmental permit. The present situation in the manufacturing and power supply sector and the related problems are presented here.

IV.1.1 Manufacturing and power supply

A switch in demand to more electricity offsets the present improvements in energy efficiency in power supply units (5 % in electricity production). The positive effect has been cancelled because the conversion rate of producing electricity is lower than that of producing heat. However, there is still considerable potential to save energy in this sector.

The manufacturing sector has also already improved its energy efficiency through structural changes, import substitutions, changes to less energy intensive processes, and direct improvements in energy efficiency. Up to now it was not possible to decouple economic growth from energy demand; however, to improve energy efficiency, the improvements must be made at the same rate as

the economic progress. This is possible, particularly in this sector, because there is a lot of potential to save energy, especially by implementing the requirements of the IPPC directive in the permit procedure. This means using other technologies (e.g. according to the BREFs) and other approaches.

It is unlikely that with the current situation of rising living standards and falling energy prices there will be a reduction in energy demand. Instead, energy efficiency should be improved in order to reduce the present energy consumption without lowering living standards. Improving energy efficiency would also lead to decoupling economic growth from energy demand and less pollution.

IV.1.2 Measuring energy efficiency

It is difficult to find one definition of energy efficiency. The starting point for defining energy efficiency in this summary is taken from the Integrated Pollution Prevention and Control… (2002). It says that "…emissions of carbon dioxide are generally used as the primary indicator when assessing the environmental impact of energy use". Assuming that all efforts that will be done in improving energy efficiency should lead to a reduction of carbon dioxide emissions, it can be said that improving energy efficiency means the following:

Improvement of the ratio of input energy to bound energy, that is energy contained in the product, should be done in a way that the carbon dioxide emissions stay at least at the same level. In other words, to minimise losses of energy, the processes have to approximate as close as possible the technical optimum, in consideration of emissions.

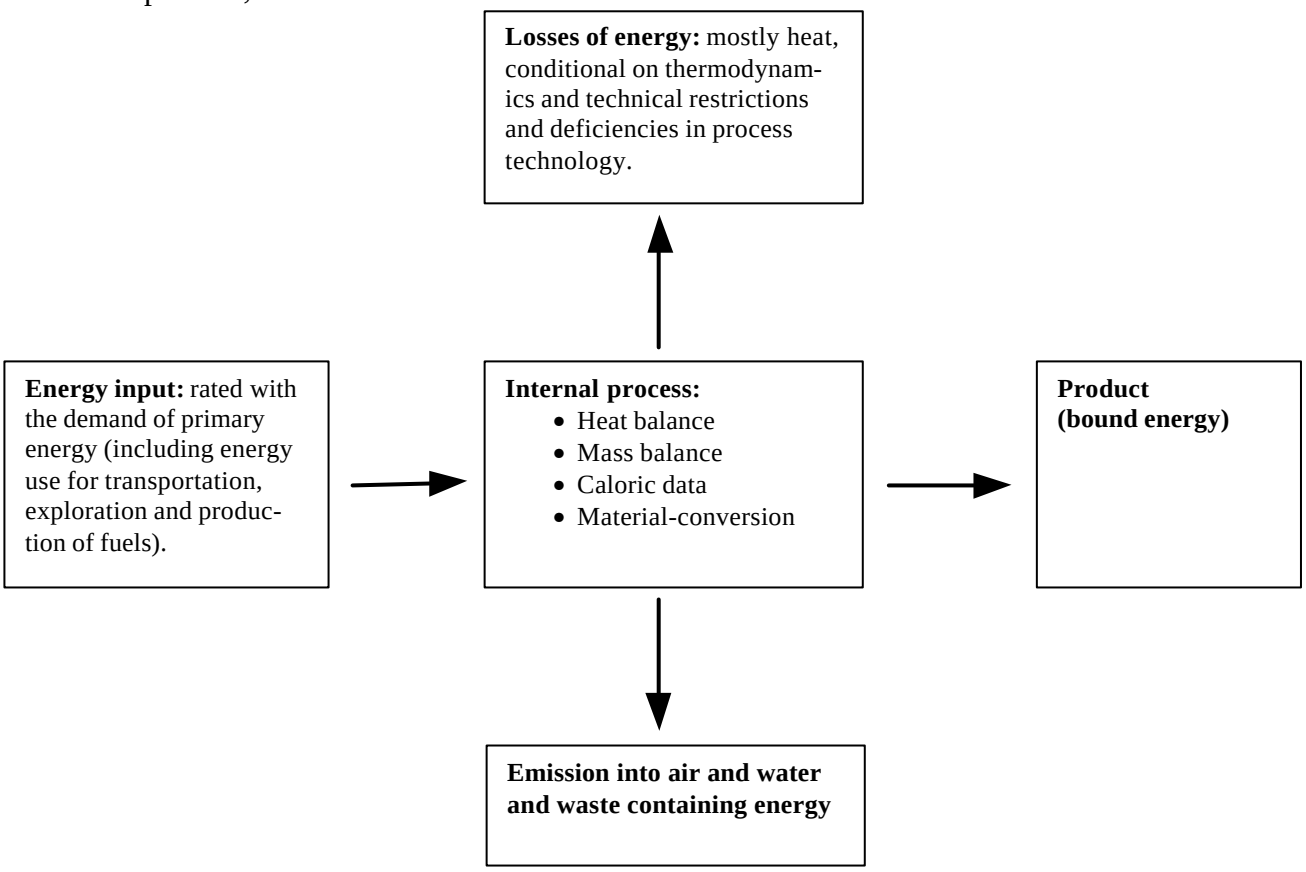


FIGURE IV.1. Energy flows in an installation (Thomas Kohl).

Quantification

It is possible to get a first rough estimation of the energy efficiency of a plant by monitoring the ratio between input energy and bound energy, because emissions and losses are relatively easy to measure with existing techniques. The energy contained in the products is the difference between input energy and the process losses and the energy content of emissions and waste as shown in Figure IV.1.

This balance checking means that company data on fuel and energy consumption, energy production and losses are needed. Confidential data about the internal process (a "black box") are not needed for this first estimation. To gain comparable data requires a valuation of the input; a good data source for the input would be the primary energy demand of the installation, that is, if electricity is used, the conversion rate and transfer losses have to be taken into consideration. A common unit to express the amount of energy use is also needed, for example toe, GJ or kWh. Once these data are collected, it is possible to do a benchmark comparing the ratios of different companies. This would provide an overview of the energy efficiency of companies in the EU. An analysis of the data would lead to a value of best energy efficiency, which would be a target value for other companies to aim at. Except for the data on losses, the tools or the systems to gather these data are already available in most EU countries, based on the answers given in the questionnaire (Annex I, Table 84).

After a rough monitoring of energy efficiency (see Figure IV.1), the next requirement is to find a tool to improve energy efficiency. The next part of this summary will show that much can be done to improve processes. To measure these "internal" improvements, process data (as shown in Figure IV.1) will be needed; but this data are mostly confidential because they expose the company or production secrets.

The companies are able to introduce a self-monitoring programme and to calculate the specific energy consumption (SEC), expressed, for example by kWh per produced unit, and to convey this result to the authorities. To do this, the company has to check all process streams, which helps to determine where in the process the most gains in energy efficiency can be achieved.

Once the company knows which points in the process can be improved, it calculates whether the improvement is cost-effective or not. If it is, the company will change the process to be more energy efficient. This information together with information on the technology used would give guidance on what is possible and what is the best available technique. The challenge in using this method is to collect the data and analyse it in a way that it is comparable. However, by gathering these data and having the skill to analyse these masses of data one can say how close a company is to the optimum or in which companies special measures are necessary to lead them to more energy efficient operations. As mentioned above, the optimum would be gaining a self-regulating system for tracking improved energy efficiency to lower costs.

IV.1.3 Potential to improve energy efficiency in the IPPC sectors

According to the AEA report (Haworth et al. 2000), the potential energy savings in Table IV.1 are within reach. Qualifications of the numbers are explained in Section IV.2.

TABLE IV.1. Potential energy savings by IPPC sector.
Tables 5.3 and 5.4 from the report by Haworth et al. (2000) are amalgamated.

Sector	IPPC coverage (%)	Saving potential (PJ)	Saving potential (%)	Confidence level
Steel	100	387	15	+++
Refineries	100	770–980	25–32	++
Large combustion plants	98	1 830	6	++
Paper	98	380–440	21–24	++
Non-ferrous metals	97	147	21	+++
Non-metallic minerals	86	152	13	+
Chemicals	74	460–790 (240–350)	16–27 (8–12)	++
Textiles	34	70–80	12–14	+
Food	31	140–180 (100–120)	9–12 (6–8)	++
Livestock	2	~2	10	+
Waste management	Not calculated	40–90	n. a.	+
Tanneries	Not quantified	not quantified		--
Manufacture of coke	Not quantified	not quantified		--
Production of carbon	Not quantified	not quantified		--
Gasification	Only demonstration plants	n. a.	n. a.	--

+++ Energy consumption data and opportunities data well defined in this sector.
++ Most countries have good data by detailed sub-sector. However, some information needed to be estimated from more limited data.
+ Little data available at detailed level.
-- No reliable data available to make an estimate for the EU 15.
n.a. Not available.

The values written in brackets assume that CHP replaces gas turbines instead of the average energy mix.

Methodology and confidence level

The values in Table IV.1 were calculated from, when possible, a benchmark between the actual SEC and a reference SEC achievable in changing to more energy efficient operations by using other technologies or other non-technical approaches, for example energy management. For a consistent benchmark, detailed data on the sector concerned and the corresponding sub-sectors are needed; however, this was possible only for the steel sector.

For all the other sectors, different methods were used, which resulted in different confidence levels. The problem was that for these IPPC sectors detailed energy data were insufficient to determine an exact SEC, because the lower the energy costs in the production of a product, the less detailed energy data are available. In the EU, economic, production and energy data are handled through the NACE system.

The NACE system gives every sector a code (e.g. 17 for textiles) and classifies the sector further into sub-sectors with a second number (e.g. 17.2 for weaving mills), and for more detailed information adds one digit more (e.g. 17.21 for cotton weaving mills). This is called the NACE four-digit-level. To generate exact benchmark values one needs the most disaggregated data that is on the four-digit-level. A wide range of data is also needed, in other words, the majority of the industries

have to be considered. This is expressed by the IPPC coverage cipher that explains which part of the sector is registered by the EU authorities. However, energy data at the NACE 4-level exists, as mentioned above, for only one sector: steel production, in which energy is one of the highest expenditures.

Only large companies are covered by IPPC, because the scope of the directive is limited to installations with a certain minimal output. Thus, industrial sectors with smaller production units and decentralised facilities are not covered. The problem of inadequate data sources is sector and country specific. This means that for all the other sectors estimates were needed to gain comparable figures. Energy estimates at the sub-sector level were based on activity data as sub-sector value added (monetary value) or physical production (such as tonnages). Additionally, numbers from geographically and economically comparable countries were used to give useful values. Therefore, the lower the disaggregation, and the worse the data availability in the Member States is, the more estimation is needed, resulting in a lower confidence level.

IV.2 DESCRIPTION OF METHODS USED TO ACHIEVE ENERGY EFFICIENCY

In the AEA report the measures for achieving energy savings and improving energy efficiency were classified into four categories:

- savings by improving process technology
- savings by adding more combined heat and power (CHP)
- savings by better energy management
- cross-sectoral devices

The values in Table IV.2 below are not exact figures but rather targets, as are the figures in Table IV.1. There are uncertainties resulting from inadequate data; hence, some of the values are underestimated while others are overestimated. The uncertainties and the confidence level of the figures will be explained for the measures in Table IV.2.

TABLE IV.2. Contribution of different technological measures to potential energy savings.
Table modified from the report by Haworth et al. (2000).

Type of measures	Energy Contribution (PJ)	% of total savings
Process technology	1 952	51
Combined heat and power (CHP)	1 325*	36
Energy Management	311	8
Cross-sector device	208	5

*Note: The assumption here is that CHP will replace the average mix of energy-generating technologies. However, according to other studies it is possible that CHP will be substituted for other highly efficient technologies, like CCGT, because of being a marginal technology. This would lead to fewer savings so that the quoted value is understood to be a maximum.

IV.2.1 Process technology

Most improvements in energy efficiency are achieved by upgrading processes. This report describes many sector-specific and precisely defined techniques, but the technical details are beyond the scope of this summary. Additionally the measures mentioned in this report are not adjusted to the BREFs (they are identified in a previous Thermie study (Fletcher et al. 1999)).

Some of the studied technologies are only cost-effective when integrated into new plants or production lines as the physical and economic life of production lines and plants are rather long. This means that the targets in Table IV.2 are not reachable in the short term.

To improve energy efficiency by improving processes will generally lead to lower costs because of reduced fuel and energy use and because of higher product quality and quicker throughput. In contrast, end-of-pipe technologies cost money and it is possible that they will increase the energy demand (thus decreasing the energy efficiency) in reducing emissions. For these reasons, improving energy efficiency has a synergy effect – it improves processes and saves energy, while it reducing emissions and costs.

The techniques investigated in the Thermie study are used in the AEA report (Haworth et al. 2000) since they can be regarded as having long-term cost-effective potential to reduce emissions by improving energy efficiency; unless there are technical restrictions or barriers to their introduction such as restrictions on capital. To consider the costs of the technological opportunities the measures were valued at a 25 % discount rate and a five-year depreciation period (corresponding to a payback in two years).

Now, having a rough estimation which savings, respectively, improvements are possible, the aim is to find a tool to measure, monitor and improve energy efficiency. One possibility is the pinch technology. This tool should be abstract and applicable in all sectors for using it in permission process to gain comparable data with as little modification as possible. The basic approach for all sectors would be the same: the heat and mass balance is checked and an evaluation of the internal processes is carried out; with this information, opportunities to improve energy efficiency will be researched as explained in the following. As mentioned in the first part of this summary this approach could lead to a type of self-regulating system. Section IV.2.2 describes what the idea of pinch technology is, how it is used and what for results are expectable.

IV.2.2 Pinch technology

Introduction

Pinch technology, or pinch analysis, was developed by Linnhoff March (UK) in the end of the 1970s to optimise thermodynamic processes. Experiences have shown that notable energy savings are reachable. The savings are between 10 % and 40 % mostly related to low or moderate costs.

This technology is very variable and is applicable both in new projects and retrofit projects and is used in nearly all branches with success, even in non-industrial branches, such as hospitals. In this report pinch technology is explained for a single process, but it is also applicable to an entire site, as a site is made up of many single processes.

Pinch technology is based on heat recovery in thermal processes; the resulting energy saving leads to a reduction of air pollutants (SO_2, CO_2 and NO_x). It is important to know that heat is the poorest form of energy and that it normally makes no sense to transform process heat into a higher grade form of energy, but that it is always possible to transfer heat from one mass flow to another if the temperature difference are sufficient.

Modus operandi of pinch technology

Pinch analysis is divided into several sections that will be explained in a brief and non-technical manner; however, some thermodynamic elements are inevitable because they are fundamental to understanding this technology.

Mass and heat balance/thermal data

The first step is to investigate the basic reactions of the process, and based on these facts, to define the existing mass and heat flows (pressures, temperatures and heat capacities). The best way to get this information is to use existing process-simulation programs. If these are unavailable, descrip-tions of the equipment or operation data can be used.

Data extraction

With the thermal data, heat and cooling energy is appointed under consideration of the potential of internal heat transmission without having regard to existing heat exchangers, as long as they are not essential for the process. The exclusion of heat exchangers will be explained later. Flows are now separated into one hot flow (which means it needs cooling) and one cold flow (which means it needs heating).

The starting point of pinch analysis is the assumption that almost all cooling energy can be seen in a relationship to heating energy, that is, hot flows can heat the cold ones by cooling themselves down. The energy that is not available in the process has to be provided by the utility flow, that is from the outside. The utility flow itself can be gained from another production (process) line (total site tech-nology).

The pinch principle and energy targets

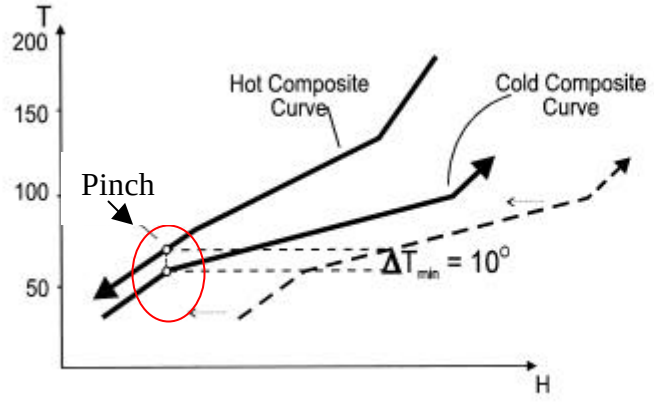


FIGURE IV.2

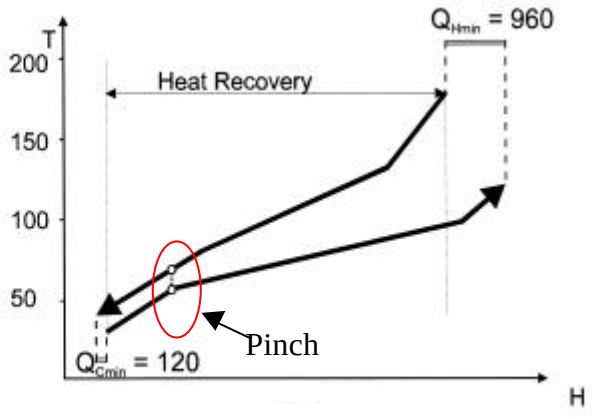


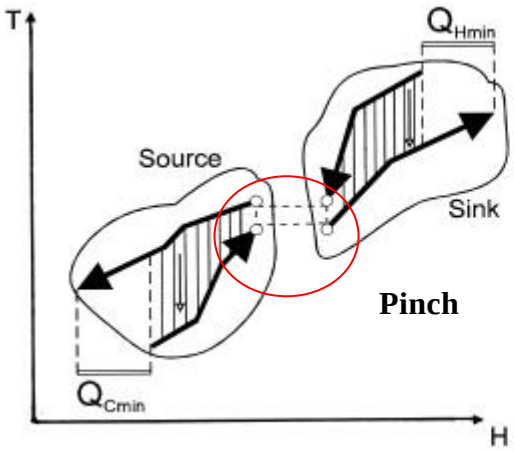
FIGURE IV.3

(Figures from Introduction to Pinch Technology 1998).

As shown in Figure IV.2, there is a minimal temperature difference (ΔT_{Min} here: 10°) under which heat transfer is no longer possible because of economic and thermodynamic reasons (the heat transfer area begins to increase). Hot and cold flows are opposed (Figure IV.2) by using the so-called composite curves and analysed for the best possible heat recovery. Doing this gives the pinch as a result.

What is the pinch? The comparison of the hot and the cold flows results in a specified temperature (depending on the studied process, here about 60°) at which the temperature difference of both flows is similar to the minimal temperature needed (Figure IV.3).

After the pinch has been determined, it is possible to identify the minimum process energy needed: Q_{Cmin} for cooling and Q_{Hmin} for heating. The remaining energy can be gained by internal heat recovery.



The pinch divides the problem into source and sink

FIGURE IV.4

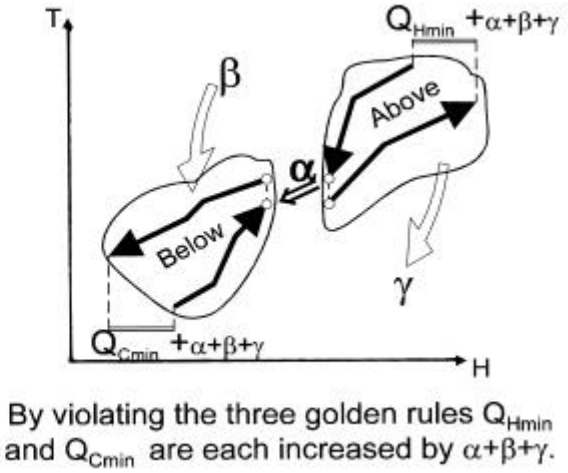


FIGURE IV.5

(Figures from Introduction to Pinch Technology 1998).

What is the significance of the pinch for the process management? The process is now divided into two systems (Figure IV.4): one system above the pinch that only needs heating (heat sink) and another below the pinch that only needs cooling (heat source).

As the two systems together with the associated utility flows (one for cooling, one for heating) are in thermodynamic balance, it makes no sense to transfer heat between the them (Figure IV.5). For example, transferring heat from the heat sink to the heat source (flow α) results in a higher power demand, because the cold system needs more cooling and the warm one, more heating.

This means that every heat transfer across the pinch, every heat addition below the pinch (flow β) and any heat removal above the pinch (flow γ) result in a higher total energy demand. The energy targets represent the minimal energy input needed, calculated with pinch technology from the extracted data.

As mentioned above, ΔT_{Min} not only depends on thermodynamic aspects but also on economic ones. The lower ΔT_{Min} is set, the lower the utility flow demand, but investments are higher for the heat exchanger. Pinch technology also calculates and optimises the investments. Hence, energy saving

effects (i.e. saving money) are set against the costs of the needed process changes and of new acquisitions and are thus optimised.

Optimisation of utility flow and process modification

After finishing this analysis, it is now apparent in which parts of the process:

- the input of high-class and expensive heating or cooling agents can be reduced, or substituted with cheaper ones, such as ones with lower energy levels (e.g. using water instead of a cooling agent or medium-pressure steam instead of high-pressure steam);
- notable energy savings result only from small modifications in the process conditions;
- heat pumps, thermal engines and turbines are integrated sensibly; and
- modifications in the existing heat exchangers are necessary so that they no longer transfer heat across the pinch. This is the reason why they are excluded from the analysis.

Possible integration of pinch technology into the permit procedure

Pinch technology can be seen as a useful tool leading to better energy efficiency. It could become part of a benchmark system, as in the Netherlands, resulting in more exactly defined guidelines on how to perform a benchmark. With a common strategy, benchmarking would lead to more comparable results as the modus operandi would be the same.

The actual situation is as follows. The aim of this voluntary agreement between companies willing to join and the authority is to aim at the Netherlands' Kyoto dues concerning the reduction of carbon dioxide emissions.

The Netherlands has chosen to reach its Kyoto commitments through voluntary agreements in which the participating companies are obliged to report on their current state of energy efficiency. The report is prepared by a third, neutral party (probably an energy-consulting company). The results are to be delivered to the authority, that is checking if the thermal and energy data is detailed enough to make a convenient statement about the energy efficiency of the company. If not, the authority is allowed to ask for further information. The third party defines the so-called best international standards by using domestic technical information and/or technology information from foreign countries or companies. The participating companies must achieve the best international standards by 2008–2012.

However, it is not guaranteed that really comparable data will be gained by the investigation. There are many ways to gather data, so it would be worthwhile to have a common way to do so. This could be done with pinch technology. It gives guidelines on which data are needed and how to treat the data, and it can, as mentioned above, be used for many production processes.

Pinch technology would thus be a convenient instrument, as it is somewhat abstract, to be included in a permit procedure. The results are promising as an Italian study shows. Italy is investigating the methodology's effects on implementation in the permit procedure. The study is already finished and the usefulness of pinch technology is obvious. The Italian authorities used pinch technology to investigate a chemical plant; the outcome was that reasonable improvements are possible.

The following is quoted from Pini et al.:

> "Conclusions: With regard to our purposes, this work confirmed the usefulness of the adopted methodology in order to evaluate the energy performance of industrial plants. The implemented procedure has a very easy and linear development, allowing an easy access to all its steps, in particular to the data input

and check. The results here presented are affected by the uncertainties connected to the data origin. An increasing effectiveness of the method is expected when using actual process data.

The procedure fits well the energy efficiency concept because it allows, as explained in the previous sections, to quantify the minimum energy consumption of a plant and the subsequent potential saving. Moreover, the applied procedure offers the tools to understand the way the energy savings can be obtained. Finally the analysis is carried out taking into consideration the economic issues, suggesting proper solutions in the assessment of the utilities.".

IV.2.3 Combined heat and power (CHP)

Combined heat and power, also known as cogeneration, is a process technology that generates energy out of primary sources into both electric and thermal energy. In contrast to a power plant in condensation mode the overall efficiency can reach up to 90 %, and with high technology even more. A modern condensation mode plant can achieve only up to 40 % efficiency, except for CCGT[1] (Combined Cycle Gas Turbine), which has an efficiency of about 60 %. The difference between the CHP plant and a conventional one is that the CHP plant, if operated optimally, has no cooling system in which the process water is reconverted by emitting heat to the environment. As shown in Figure IV.6, the CHP plant distributes the waste heat to a district heating network, or if the plant is part of the power supply of a company the heat is used in the form of steam or hot water as a power source. Electricity that cannot be used by the company is fed to the grid.

Figure IV.6 is a basic scheme of an extraction power plant. The fuel is burned in a combustion chamber, which heats the water in a boiler to produce high-pressurised steam, as is done in a conventional plant (back pressure mode). The steam is transformed into mechanical energy in the turbine and the hot fluid or at least some of it (non-optimum scenario) is extracted to a heating network. The contingent excess heat is emitted to a cooling system. Power plants operating in condensing mode extract all heat not needed in the cooling system and release it to rivers (typically 8–10°C higher than the cooling water intake), which can cause environmental impacts. Other process losses, for example, flue gas losses, and mechanical, electrical and other heat losses, are similar for both kinds of technologies.

The assumption for the reasonable use of CHP is that there is a real demand for heat so that the "by-product" heat is used in a sensible way. In other words, if the heat produced by a CHP plant is not used, there is hardly any difference between a CHP plant and a plant operating in the condensing mode.

[1] CCGT: Combined Cycle Gas Turbine technology is using both the kinetic energy of the combusted gas in a gas turbine as well as the heat energy of the exhausts in a conventional steam turbine by using steam. The efficiency is up to 55 % and expected to increase in further developments.

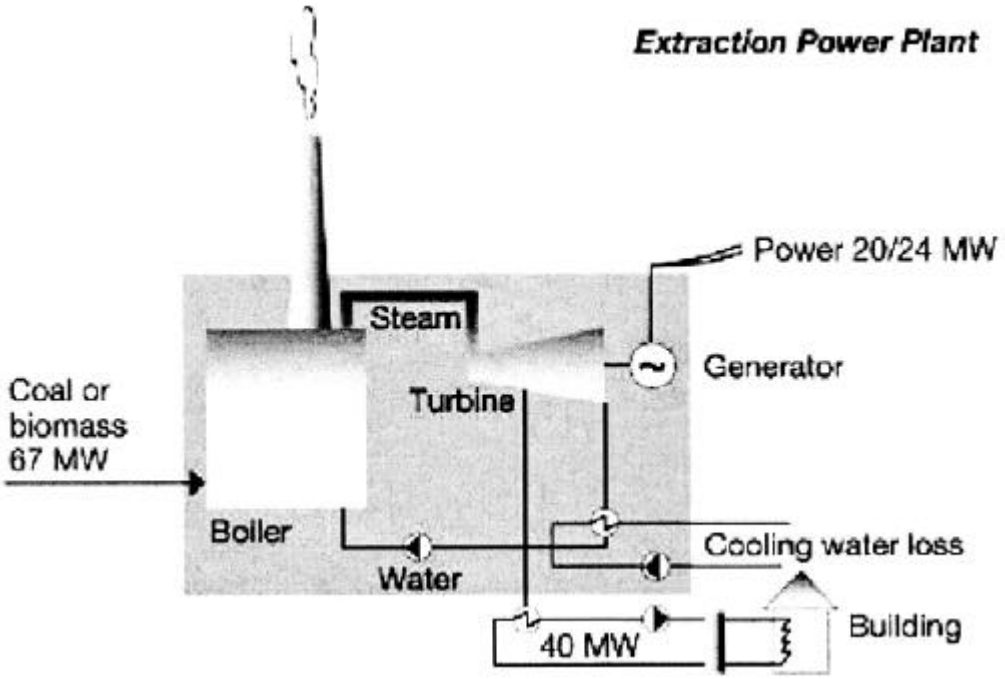


FIGURE IV.6. Extraction power plant. (Source: SAVE CHP/DHC: Evaluation of… 2000).

Qualification of the figures

The saving potentials shown in Table IV.2 are to be seen under the following limitation. The assumption of the study is that CHP replaces the average energy mix, but it is expectable that in some countries where the CCGT technique is marginal CHP will replace CCGT plants having an efficiency of more than 55 %. This would considerably decrease the impact of CHP to the total savings.

The potential energy savings are taken from the Thermie study that investigated the cost-effective saving potential of CHP. The cost-effectiveness can be very high for CHP plants, but it is unlikely that all cost-effective measures will be introduced. Finally, some of the measures are effective only when building new plants or retrofitting old ones because the estimations are based on the fact that only the newest CHP technology will be used.

The result is that the savings are to be seen as a best-case scenario. Requiring the use of CHP is no short-term measure because, on the one hand, the capital investment for CHP plants is high and, on the other, the lifecycle of existing older and less efficient plants is quite long (about 15–25 years). However, those savings are technically contingent.

Difference between electricity generated in the condensing mode and the "real CHP" mode

The Union of the Electricity Industry (EURELECTRIC) has investigated the difference between electricity produced by a CHP plant either in the condensing mode or in the "real CHP" mode. EURELECTRIC concluded that there are CHP plants with a worse total conversion rate than heat-only plants or plants operating in the condensing mode. First, "real CHP electricity" is defined.

Since CHP is only a technique used to produce heat and power simultaneously, CHP makes no prediction whether the produced heat is really used. The EURELECTRIC definition of CHP goes be-

yond the scope of the technical one: “real CHP electricity” is only that part of the produced electricity that is linked with a sensible use of heat. Sensible use of heat can mean use inside the production plant in the form of hot water or steam or use in a district heating network. If not used by the plant itself the assumption is that if a customer is paying for the heat, the power is used sensibly.

The problem is that many CHP plants can operate in full back pressure mode (i.e. maximum heat use) and also in full condensing mode. The mode can mostly be continuously variable. Protermo, a Finnish company, has developed a method to monitor plants by considering the ratio of the real CHP mode to the “condensing mode CHP”. As this summary does not aim to discuss the number of existing power plants that are working sensibly, no further presentation of the report’s results is provided.

Nevertheless, there is consensus that CHP plants should be regarded from this aspect, since CHP can improve energy efficiency if operated in the back pressure mode. If this is not possible, the overall efficiency of CHP is no higher than that of a conventional plant, and can even be less, if compared to a CCGT plant with potential energy efficiency of up to 60 %. Moreover, emission savings are only possible if the efficiency is improved, because the two are directly connected.

CHP and district heating

A CHP plant produces electricity and heat simultaneously with the effect that the input energy is utilised to a higher degree. The average efficiency of an electricity producer is about 32–35 % with the potential to improve it by around 40 %. However, the production efficiency of a CHP plant can be over 90 %, as the waste heat energy is used either in a process (e.g. in the form of steam) or in a heating network. Hence, using CHP plants for generating usable energy improves efficiency considerably. CHP plants use up to 90 % (modern plants even more) of the energy released by fuel combustion. Another application for CHP plants is the use in district cooling systems. Currently, this technology is experimental.

The losses in the heating pipe network increase with the distance; thus, the consumers should be located as close as possible to the plant. CHP plants can be either small-scale units or centrally located generating plants. However, large CHP power plants situated far from inhabited areas cannot take advantage of the whole potential of CHP because the heat losses and the network costs to reach the customers would be so high that using the technology would be inefficient and uneconomic.

Normally the demand for heat is lower than for electricity and therefore power plants will produce unused heat. This situation can be improved by increasing the electricity to heat ratio, for example with combined cycle technology. However, CHP can lead to better energy efficiency in the IPPC sectors by building more small-unit plants with high efficiency, especially in production plants with a high demand for heat (for example in the pulp and paper sector about 48 % of the possible savings results from CHP).

At the same time, the efficiency of CHP plants situated close to inhabited areas could be improved if the waste heat is fed into a district heating network. Doing so does not improve the efficiency of the process but rather the total energy efficiency of the plant.

IV.2.4 Energy management

Improving a company's internal energy management is a low cost measure that involves setting up a management system to monitor and reduce energy use (mainly by organisational changes). The advantage of this is that it is linked with moderate costs and is achievable in a short time. As this measure is not directly linked with technical knowledge it is not regarded intensively. Nevertheless, improving energy management can also be a considerable contribution to more efficient energy use, with the advantages mentioned above.

IV.2.5 Cross-sector devices

Cross-sector devices are energy saving technologies such as motors, drives and boilers. The potential of this measure can also be affected by pinch technology if they are applied to a total site or several companies located in the same area co-operate in their use. It is important to note that this measure is possible in the short term at moderate costs. However, the AEA report mentions cross-sector devices only as regards their contribution to energy savings.

IV.3 SUMMARY ON TECHNICAL POSSIBILITIES

IV.3.1 General

The IPPC directive obliges the EU countries to use energy efficiently. But no further guidelines are given. In fact, energy efficiency has already improved in the IPPC sectors but further improvements are necessary. The goal is to reduce carbon dioxide emissions as the EU agreed in the Kyoto protocol. Due to the fact that energy savings are hardly to be instructed and a decreasing power demand is also unlikely, the way to reduce energy consumption is to improve energy efficiency.

This report defines energy efficiency as: improving the ratio of input energy to bound energy in a way that carbon dioxide emissions stay at least at the same level. This would lead to a reasonable living standard combined with less energy use, and would also result in less emissions. In time, it may also lead to improved living standards combined with a decreased energy demand and declining carbon dioxide emissions.

The first task is to find figures to evaluate energy efficiency. This is important because without such comparable figures it is impossible to make a prediction about the state of energy efficiency. Also, propositions about the potential for further improvements are impossible. The total energy balance of a power production plant is relatively easy to measure, because all input energy is used to produce usable energy. Thus, only the ratio between input and output has to be considered. This is the easiest calculation for an energy efficiency figure. Efficiency figures should always be applied to the use of primary sources because they include the total carbon dioxide emitted to the environment.

The power production sector is the "source" of most of the used energy. This means that if the power supply industry is improving its efficiency, the total IPPC efficiency will improve because the sectors have less need for primary energy. Other sectors (household, service and traffic) would also benefit from improved efficiency for the same reason. Although the power supply sector can do much to improve energy efficiency, the contribution of other industries should not be ignored.

In order to be able to allocate figures for the other IPPC sectors, the method has to be changed. The energy content of a specific product is not as easy to measure as power is (usually in watts). This can be calculated by monitoring the input and losses.

To calculate the energy content of a product, that is, the specific energy consumption (SEC), more detailed energy data are needed. These numbers are comparable within the sector's plants. In this way it is possible to determine the potential of energy efficiency standards achievable by date and to monitor or control companies by requiring them to investigate the SEC results. However, the end-result of this monitoring system is a self-regulating monitoring system that leads to more energy efficiency. One restriction would be that the measures taken to reach this target would have to be profitable. But, most of them are as they reduce fuel costs and sometimes also lead to improved product quality. However, some of the measures, such as combined heat and power (CHP), are long-term investments because of the long lifecycle of the installations.

Because of the differences in data availability (most sectors do not have enough specific data to calculate figures with a high degree of confidence), the confidence level varies in the different sectors. The range of the savings varies by 15–30 %. The overall potential of improved energy efficiency in the IPPC sectors is primary energy savings of 12–14 %.

The emission savings are connected to energy savings in conformance with the definition given above. As a synergy effect improvements in energy efficiency will decrease emissions. The overall potential of emission savings linked with improved energy efficiency is 8–11 %.

The ways to improve energy efficiency were separated into the following categories:

- savings by improving process technology
- savings by adding more combined heat and power (CHP)
- savings by better energy management
- cross-sector device.

Even the low-cost measures, energy management and cross-sector devices, make a considerable contribution to the total savings. Another advantage of these measures is that they can be implemented within a short time.

However, the greatest contributions come from improvements in process technology and the introduction of more CHP. Although these measures are mostly linked with high investments they will often be cost effective. The disadvantage is that these measures need more time to be introduced, because some of them are to be integrated into new or retrofitted plants. This means waiting until the end of the lifetime of an installation.

IV.3.2 Process technology

Upgrading processes gives the most energy savings. Next step is to know how to measure the state of art and to decide on the potential improvements. One approach to this is pinch technology. Pinch technology is abstract enough to be incorporated into legislation, but variable enough to be applied across different sectors.

In thermodynamic methodology, all processes are checked whether they are operating at optimum. This approach, together with a benchmark system, could be an effective tool to monitor, regulate and improve energy efficiency, and to investigate the best techniques and the best processes. The advantage is that a common basic approach is used for the same processes, resulting in comparable

data. This makes it possible to set limits for a specific production line, for example in the form of GJ per produced ton of steel. The process that uses the lowest amount of energy could be declared as the best technology. Once these best techniques have been identified, it is then possible to say that all other industries have to aim to reach this standard in a specified period of time. The Italian environmental authority has already tested pinch technology successfully.

Pinch technology can be a practical instrument to monitor, supervise, regulate and improve energy efficiency, especially if combined with a benchmark system.

IV.3.3 Combined heat and power (CHP)

Combined heat and power, also known as co-generation, is the simultaneous production of heat and power in one process. As the heat is used sensibly (in the form of hot water or steam as an energy source in the production process or fed into a district heating network), the overall efficiency can reach 90 % when state of the art technologies are used. In contrast, conventional plants operating in the condensing mode can only achieve a maximum efficiency of 40 %, or if combined cycle gas turbine plants (CCGT) are used, 58 %. However, CHP technology is marginal in some EU countries.

Because of the high investments for CHP, the figures shown in Table IV.2 are to be seen as a technical potential. This means that it is technically possible to reach these savings, but the assumption is that all existing plants are altered to be state of the art plants. It is important to note that CHP plants only contribute to improved energy efficiency if they are operated in the back pressure mode. This means that the produced heat must really be used. If not, a conventional plant would suffice, because all heat is transferred to a conventional cooling system. Especially older CHP plants would even be less efficient than a modern condensing mode plant that releases all heat to the environment. Releasing heat to the environment is the greatest problem of large CHP plants. As these plants are centralised power producers, there is a need for a long-distance heating network, which increases the heat losses. Such a network is also quite expensive. These factors lead to problems in installing new heating networks. Nevertheless, with some effort it is possible to install networks and operate them efficiently, as, for example, the city of Helsinki does. Helsinki operates one of the largest and most efficient district heating networks in the EU.

The most economical way to use the potential of CHP is to install multiple small-scaled units that are situated close to potential customers. In turn, these units have a need for better environmental protection systems, as the most capable ones are presently only available at moderate costs for large-scale plants. By making such techniques cost-effective (e.g. granting subsidies), the potential of CHP would be realised.

As the demand for electricity is higher than for heat there will always be unused waste heat. To improve on this it is possible to install small-scaled units in a sector's industries with a high heat demand; the excess electricity can be fed into the municipal grid. This also results in a higher total efficiency. The technical potential of CHP can improve energy efficiency considerably.

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ANNEX V: ANALYSIS OF THE PROPOSED EU-WIDE GREENHOUSE GAS EMISSIONS TRADING SCHEME

V.1 INTRODUCTION

Emissions trading is one of the three Kyoto flexible mechanisms[1], the purpose of which is to enable countries to reduce CO_2 emissions cost-effectively. Within an emissions trading scheme, countries can trade emission allowances. Such a scheme is flexible and cost-effective, because the emissions reductions are done in the country or installation with the lowest marginal reduction costs. With emissions trading across the European Union (EU) it would be possible to reduce abatement costs by an estimated 10 %. The Nordic Quota Trade Experiment shows that the aggregate costs for Denmark, Finland, Norway and Sweden can be reduced by almost 50 %. An emissions trading scheme with individual installations allowed to trade across the EU would be a powerful tool for lowering the costs of compliance and reducing adverse competitive impacts. (FIELD 2000, 15.)

[1] Kyoto flexible mechanisms are emissions trading (ET), joint implementation (JI) and clean development mechanism (CDM).

Within the EU, emissions trading is a relatively new instrument for environmental protection. In March 2000, the European Commission adopted "The Green Paper on Greenhouse Gas Emissions Trading within the European Union – COM (2000)87" that launched the debate on how the EU-wide trading scheme should be implemented. Emissions trading has received strong support both in the work on and discussions within the "European Climate Change Programme – COM (2000)87" and in consultation meetings with stakeholders, Member States and future Member States. It is considered an important part of the EU's Kyoto protocol implementation strategy. Recently, Member States have been developing national trading schemes and the European Commission presented the "Proposal for a Framework Directive for Greenhouse Gas Emissions Trading within the European Community – COM(2001)581" in October 2001. The EU-wide scheme would give experiences in emissions trading before the international trading scheme under the Kyoto Protocol is planned to begin in 2008. The proposed directive would establish a flexible trading scheme from 1 January 2005.

The details of how international trading will operate are being negotiated. The implementation schedule is quite strict, and determined actions to establish a legislative framework at both the EU and Member State level are needed. There are numerous implementation problems to be resolved, for example how such a system could be combined with Community legislation, domestic policies and measures, and the use of other Kyoto mechanisms, and how the scheme itself should be implemented. In this paper these questions and especially the linkage between the IPPC directive (Council Directive 96/61/EC) and the trading scheme will be analysed. This Annex represents the emissions trading situation during the spring 2002.

V.2 EMISSIONS TRADING AS AN ENVIRONMENTAL POLICY INSTRUMENT

V.2.1 Theoretical background

The theory of tradable emissions permits is based on environmental economics. The economic definition of pollution is dependent upon both the physical impact on the environment and the human reaction to this physical effect. The impact that human actions have on environmental quality is called external cost (externality). The external cost is the difference between the private and social costs, and it is not included in market prices. An actor suffering from an externality does not receive compensation for it. In order to internalise external costs to the market mechanism and prices, the authority can change the costs and benefits of the actions that have an impact on environmental quality by using economic instruments such as environmental taxes or emissions trading. In these circumstances, polluters benefit by changing their behaviour. (Pearce and Turner 1990, 61.) Another way to explain the nature of externalities is the common ownership of resources. This is called the tragedy of the commons, where the ownership of the resources is not defined and the exploitation continues until it is no longer profitable. The exploitation costs are common but the profits are private. Thus, the behaviour is individually rational but collectively undesirable. (Costanza 1991, 321–322.)

J. H. Dales first developed the theory of tradable permits in 1968. The idea is that the authority allows only a certain level of emissions by issuing only a certain number of allowances. In this way, the total amount of emissions is capped. (Pearce and Turner 1990, 110–111.) The system combines the certainty and effectiveness of an administrative standard with the efficiency of market alloca-

tion. The cost-effectiveness of emissions trading results from the trading that equalises the marginal control costs of the polluters included in the trading scheme (see Figure V.1).

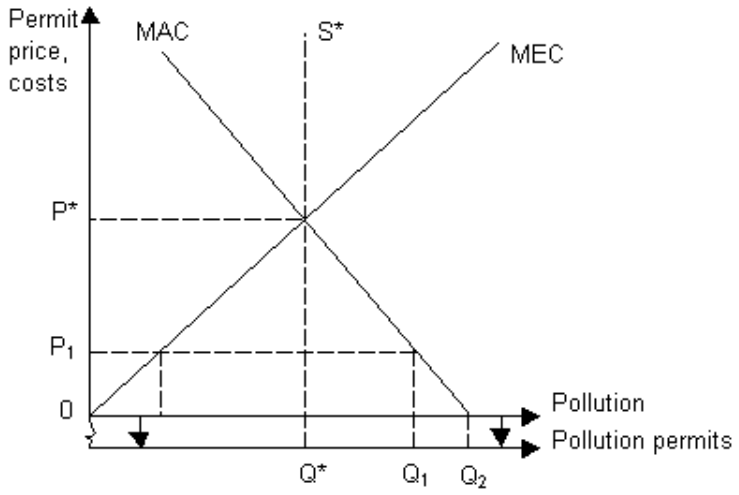

FIGURE V.1. Tradable emission permits (Pearce and Turner 1990, 110).

In Figure V.1 the emissions levels and the number of permits are on the horizontal axis. The easiest assumption is that one allowance equals one emission unit. The abatement costs and the allowance prices are on the vertical axis. The MAC curve shows the marginal abatement costs. It describes how much it costs to reduce emissions by one extra unit. The slope is negative, and thus, if the environmental goal is strict, the final reductions are very expensive. The MEC curve describes the marginal external costs of the emissions. This curve illustrates how harmful the last exposed emission unit is by assigning a monetary value to it. The slope is positive, and thus, the higher the total emissions level, the higher the marginal costs. (Pearce and Turner 1990, 110.)

For a social optimum, the allowance price is P*, and the emissions level and the number of allowances is Q*. This equalises marginal abatement and external costs and, therefore, the contamination is theoretically optimal. (Pearce and Turner 1990, 110.) Economic theory assumes that the environment has some level of assimilation capacity that can be defined. This is the number of allowances (Q*) that the government admits (S* curve). It can be assumed that the MAC curve is also the aggregate demand curve for the allowances, thus, it gives the number of allowances that is demanded at each price level. If the marginal emissions abatement costs for a single actor are P_1, the actor invests in abatement technology because the investment costs are lower than the allowance price P*. Similarly, if the costs are higher than P*, the actor buys allowances from another polluter, who has lower costs. Therefore, through trading, the total costs will be minimised. (Pearce and Turner 1990, 111.) The supply of allowances is regulated by the authority and does not respond to price. If the total emissions are higher than the total number of allowances, the emissions must be reduced to the level corresponding to the number of allowances. If environmental policy targets change, the authority can reduce or increase the supply of allowances to the desired emissions level.

V.2.2 Main features of the permit market

In the permit market the object of purchase is a quota, an allowance (permit/cap/credit) for a certain level of emissions. There are two kinds of quotas: emissions permits and ambient permits. The basis of the emissions permit is the level of emissions. With the ambient permit, the state of the environ-

ment is also observed. The quality standards of the ambient permits might vary according to the receptor point and the permits have to be obtained from the market at the receptor point. In an EU-wide CO_2 trading scheme, the allowances would be emissions permits, because the impacts of CO_2 emissions are global. The emissions would be expressed in tonnes of CO_2 equivalent.

The allowances can be allocated at the beginning by grandfathering, auction or a mixed system. In an auction, every participant has to buy allowances for every emission unit. In grandfathering, the allowances are given freely to the participants based on earlier emissions or the energy efficiency of the operations. Grandfathering gives cost savings to the participants compared with the auction, because the participant has to buy allowances only for the emissions exceeding earlier emissions.

There are two main classifications of trading schemes. The 'baseline or credit' system and the 'cap and trade' scheme. It is also possible to combine these. The baseline system (credit trading) is more project-based, because an emission profile, the "baseline", is specified for each participant. The baseline can be projected based on past emissions, expected technological changes, and an increase in emissions or abatement opportunities. At the end of an agreed period, emissions reductions below the baseline earn emissions credits. These credits can be traded to other participants. The actual reductions from the baseline should be measurable. There is no binding cap for emissions; therefore, the incentive to reduce emissions must be provided, for example by recognition of early action to trade (early crediting). Canada, for instance, uses this kind of scheme. If the scheme is voluntary and contains early crediting, it offers a practical starting point, because it allows companies to act without delay before the details of an internationally acceptable scheme are decided. These early credits should be fully compatible with future official schemes. With this type of scheme, the markets actually drive greenhouse gas (GHG) mitigation efforts. (Sonneborn 1999, 2–3, 6, 9.)

The cap and trade system (allowance trading) is more widely used than the baseline system. For example, Denmark has established a cap and trade system for electricity plants with capacity over 30 MW. The cap and trade scheme involves trading of emissions allowances, and the total number of allowances is limited, that is, "capped". Participants are free to buy and sell allowances, but must have sufficient allowances to cover their own emissions at the end of an agreed period. (Sonneborn 1999, 2.) The cap and trade model is a better way to implement an emissions trading scheme, because the total amount of emissions is limited; thus, it addresses more strongly the environmental benefit of the scheme. With rate-based credit trading, the environmental outcome is at risk due to output increases (Egenhofer 2001, 37).

A bubble means the implementation area in which the total amount of emissions is limited to the desired emission level by the control authority. All sources are required to have allowances that specify exactly how much the firm is allowed to emit. (Tietenberg 1996, 337.)

Banking means that the polluter can save the allowances for use or to be sold in the future. In the EU-wide scheme during the first three-year period, allowances can only be banked from one year to the next. Whether installations will be allowed to carry banked allowances to the second period from 2008 will be at the Member States' discretion. In subsequent five-year allocation cycles, they would have unrestricted rights to bank allowances. In an offset system a new firm has to prove that its activity in an area improves the state of the environment. The firm would buy allowances in an exchange ratio of 2:1, for example. This requires two allowances for an emission amount of one allowance. It can also be required that the firm has to decrease its emissions in another area (Solomon 1999, 373). Netting is internal trade between sources in the same plant or facility. In other words, allowances are transferred between the actor's own installations or factories.

V.2.3 Transfer of allowances and cost-effectiveness

The transfer of allowances results in cost-effectiveness (Figure V.2).

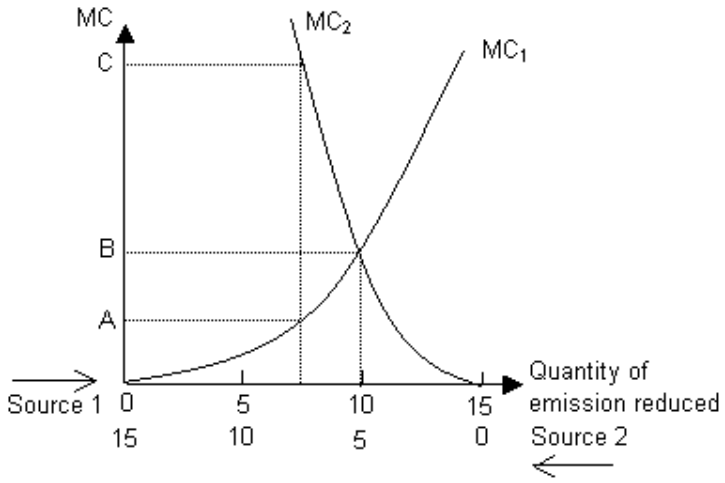

FIGURE V.2. Cost-effectiveness and the emission permit scheme (Tietenberg 1996, 338).

Figure V.2 has two sources of emissions: sources 1 and 2. The marginal abatement costs are on the vertical axis and the quantity of emission reductions is on the horizontal axis. There are 15 issued allowances and allowed emissions. With the traditional command and control –instrument, if the same 7.5 units of emission reductions are demanded from both sources, the total costs will be high, A+C. There is an incentive to trade emission allowances, because the control costs for the second source are substantially higher than for the first. The second source can reduce its costs by buying allowances from the first source at a price lower than C. At the same time, the first source will be better off by selling allowances at a price higher than A. This trading of allowances will continue until the quantity of the emission reductions for the first source is 10 units and for the second, 5 units. Accordingly, the number of allowances for the first source is 5 and for the second, 10. This optimum is at the intersection of the marginal cost curves, MC_1 and MC_2. At this point, the marginal cost for both actors is B, and the total abatement costs are minimised, because (A+C) > (B+B). (Tietenberg 1996, 338.) This is the situation in theory, but in practice there are several factors, for example high transaction costs, that prevent the markets from acting efficiently. In the emissions trading context these factors are information problems, which cause, for example, search costs, high negotiation costs resulting from market opportunism, and monitoring costs.

V.2.4 Criticism of emissions trading

The use of economic instruments in environmental policy has received much criticism, because the economic system incorporates a number of biases which operate against sustainable development.

The biases within the economic system are, for example, common ownership of resources, future discounting and the effects of uncertainty. The exploiters of common resources have little incentive to conserve the resources. A trading scheme can define the ownership of a resource. However, this does not resolve the problem of the future generations' rights and uncertainty. In a permit market

the uncertainty of future events and the asymmetrical distribution of information decrease the market activity and lead to market failures. By providing clear rules for the scheme and by announcing changes in environmental policy targets as early as possible, market failures can be prevented. (Sprenger 2000, 24.) The experiences of trading schemes in the United States show that market activity is not certain on the permit market and many U.S. schemes have failed because of high transaction costs (Solomon 1999, 372). Thereby, the cost-effectiveness, which is often said to be the good feature of a trading scheme, has not been reached.

The fixing of emission limits is also problematic. According to the economic model, polluting is optimal when marginal costs and benefits are equal. However, the marginal costs and benefits are difficult to define, especially when they concern abstract concepts that are difficult to describe in monetary terms, such as the value of species and landscapes, and health risks. This is why the economic models are often far from reality. (Hoffrén 1994, 62–63.) The economic model of emissions trading assumes that the marginal costs also describe the optimum for the environment, so it does not recognise that environmental damages threaten ecological sustainability. (Costanza et. al. 1997, 218.)

Under an emissions trading scheme an installation can technically buy a permit to pollute and cause environmental damage, even though it could be considered ethically wrong to do so. The trading scheme has been criticised because of this right 'to buy a permit to pollute', which, in effect, takes away the right of future generations to a clean environment. On the other hand, without a trading scheme installations can pollute for free (Costanza et al. 1997, 203). In addition, other economic instruments and traditional command and control instruments also give inadvertently a right to pollute. According to a report by the Organisation for Economic Co-operation and Development (OECD), the problem is no worse with an emissions trading scheme than with other instruments such as environmental taxes (OECD 1999, 10).

Another question is whether it is realistic to search for a solution to environmental problems by using an instrument that is based on the same market mechanism that has caused the problems. The Nobel Prize-winning economist, Friedrich von Hayek, has said that it is ironic that economists have been invited to solve problems they have been partly responsible for themselves. As Einstein said, "we cannot solve the problems that we have created with the same thinking that created them". (Söderbaum 1999, 106.)

These problems make it important that implementation options, enforcement and monitoring are applied when using market-based instruments. With an emission-trading scheme, it is not guaranteed that the market mechanism will automatically work efficiently. Rather, monitoring must be done to ensure that the conditions for market efficiency really exist.

V.2.5 Implementation in practice: a new instrument

The theory of tradable permits has been shown to be theoretically effective, but its implementation in practice necessitates the increased involvement of professionals in many fields besides economics. Economic models ignore several factors that have an impact on implementation. For example, institutional features and political parameters of trading systems interact in complex ways, and these factors (transaction costs, institutional experience, implementation costs, etc.) will determine the success of a trading scheme in practice. (Solomon 1999, 385.)

According to Sprenger (2000, 7, 24), it is necessary to have empirical evidence of implementing instruments in practice. The applicability of an instrument cannot be determined by theoretical arguments. When the instrument is new the implementation and administrative costs can be high and the costs of establishing a trading scheme can outweigh the expected savings. There is no practical experience in implementing emissions trading in the international context, but in the EU the concept of tradable emission allowances is not totally unfamiliar. National pilot schemes are a useful way to get learn-by-doing experience. Canada, New Zealand, Australia, the United States, the United Kingdom, Denmark and Norway have recently set up or decided to set up a national trading scheme. These pilot systems help to mitigate the economic risks of inaction and offer information about transaction costs, which present obstacles to efficient levels of emissions trading, the impacts that the scheme has had on the price of allowances, and companies involved. (Sonneborn 1999, 2, 9.) Other practical examples of allowances with some degree of transferability are the quotas for ozone depleting substances under the Montreal Protocol, the fish catch quotas under the European Union's Common Fisheries Policy, and the milk quotas under the European Union's Common Agricultural Policy. (Commission… 2000, 8.)

One way to evaluate the usefulness of a trading scheme is to investigate whether it creates enforcement problems that would not be present without trading. This can be done, for example, by considering what additional information regulators in a trading scheme require. If the gains to firms from trading exceed the cost of those resources, then a trading programme can still be justified on efficiency grounds. (Hahn and Hester 1989, 388.)

Almost all practical experiences of trading schemes are from the United States. There is little information about national trading schemes in EU countries because these schemes are only in the early stages. Thus, most of the studies that suggest how a trading scheme should be implemented are based on the U.S. experiences, which show that there are many problems in implementing a trading scheme in practice. The implementation options concern issues like scope, market failures, monitoring and the allocation of the allowances. However, these U.S. experiences cannot be generalised to European circumstances and the CO_2 trading scheme. Studies of the SO_2 trading scheme, for example, suggest that this scheme is also a good way to reduce GHG emissions, especially to deliver cost-effective emission reductions. Nevertheless, there are significant differences between GHG and SO_2 trading. For example, SO_2 has mainly regional impacts, but CO_2 emissions cause global impacts. Moreover, the CO_2 trading scheme has a much larger number of participants and more diverse processes and activities. Therefore, the CO_2 trading scheme requires features unique to these circumstances. (Sonneborn 1999, 2.) The U.S. experiences do, however, give some understanding about the implementation options of a trading scheme. The United Kingdom's and Denmark's schemes, although still in their early stages, are used in this report to give a picture of climate policy and emissions trading schemes in the EU countries.

V.3 PRACTICAL EXPERIENCES OF TRADING SCHEMES

V.3.1 U.S. Acid Rain Program

The Acid Rain Program was established under the Clean Air Amendments of 1990 for SO_2 emissions from fossil-fuelled electric power plants. It is thought to be the most successful trading scheme in the United States. In 1985, total SO_2 emissions were around 23 million U.S tons and electric utilities emitted 16 million U.S. tons. The Acid Rain Program set a national cap of 8.95 million U.S. tons per year on the total emissions from all utilities.

The cap was to be implemented in two phases. The intent of Phase I of the program from 1995 to 2000 was to reduce total power plant emissions by 50 % from the baseline emissions. The baseline was calculated from the average emissions in 1985–1987 in the eastern and mid-western regions of the United States. These regions are the sources of the acid depositions in upper New York State, New England and south-eastern Canada. By 1 January 1995, each of the 110 highest-emitting plants had to hold allowances equal to its total annual emissions. At the same time, those emissions had to be no more than 50 % of the plant's baseline emissions, unless allowances for any excess emissions were acquired from other plants or through the annual auction of the U.S. Environmental Protection Agency (EPA). This meant that the utilities had to meet an interim ceiling of 5.7 million U.S. tons. In Phase II (2000–2009) the total amount of emissions is capped, and the number of allowances is based on the national cap of 8.95 million U.S. tons of SO_2. In addition, Phase II includes smaller, cleaner plants throughout United States. (Howe 1994, 154–155; Klaassen 1996, 145–146; Määttä 2000, 54–59.)

Each allowance gives its holder the right to emit one U.S. ton of SO_2 in a specific year. Allowances are allocated for each year beginning in 1995 and are based on average fossil fuel consumption from 1985 to 1987 and an emission rate. Allowances can be purchased from other plants, from a stockpile of allowances withheld (or "reserved") from issuance each year by the EPA, or from an annual auction conducted by the Chicago Board of Trade under contract to the EPA. The allowances sold by auction consist of ones that are offered by individual plants and the EPA's "reserved" allowances not previously sold directly to the polluters at the fixed price of USD 1 500 per U.S. ton. The EPA created the reserve by taking away 2.8 % of the annual allowances from every plant that obtained its allowances under the initial, free distribution. The main object of the direct sales is to guarantee that new firms always have a way to buy permits. This prevents existing firms from withholding allowances and thereby blocking the entry of new firms on the market and reducing the competitiveness of the market. Allowances are for sale to any party, including environmental groups that may want to hold them to ensure improvements in air quality. Allowances can also be banked, which means that unutilised annual allowances can be held for future use or selling. (Howe 1994, 154–155; Klaassen 1996, 146; Määttä 2000, 54–59.)

If a polluter does not have enough allowances at the end of the year equal to its total emissions, the penalty is USD 2 454 per excess SO_2 U.S. ton (1996). This is 20 times higher than the allowance price of USD 140 (March 1998). The penalty is so high that it has never been imposed. In addition to this penalty fee, the EPA deducts one allowance from the polluter's entitlement for the following year for each U.S. ton over the emission limit. (Määttä 2000, 54–59.)

During Phase I, SO_2 emission reductions have been significant. In 1995 the average emissions per polluter taking part in the program were 4.5 U.S. tons, which is more than 50 % less than in 1990 and more than 39 % less than in 1994. In contrast, the emissions of firms outside the Acid Rain Program increased from 1990 by approximately 12 % and from 1994 by 5 % by 1995. The allowance price was estimated at the beginning of the program to be USD 600. This is much higher than the actual price of USD 140 (March 1998). (Howe 1994, 154-155; Määttä 2000, 54-59.) Most of the market activities have been shifts and redistributions of allowances within one utility. Approximately 20 % of the private transfers to date have occurred between economically distinct installations. Extensive trading has not been necessary and the price of allowances has been lower than expected because of the following:

- Initial allocation of allowances was based on historical production levels (grandfathering) and the limits reflected normal electricity production levels, although at reduced emission levels. The overall emission limit for Phase I was consequently not too difficult to meet.

- There was an unexpected supply of low-cost compliance options available to utilities, such as the increased availability of cheaper low sulphur coal due to de-regulation of railways.
- Trading reduced the need for spare SO_2 scrubber capacity to cover periods of maintenance and unplanned outage. Trading also provided an incentive for development of more efficient scrubbers and increased competition between suppliers, which has reduced the cost of scrubbers. (Mullins 1998, 9.)

There is no accurate information about cost savings, but studies give some approximations that range between 1 and 3 billion dollars per year. The total SO_2 abatement costs are approximately 4 billion dollars per year. The program has been administratively efficient. The administrative costs of the trading scheme have been 2 billion dollars. The EPA had estimated the cost at 4 billion dollars. With command and control instruments, the administrative costs were estimated to be 5 billion dollars. There are about 1000 persons working on the administration of the trading scheme at the EPA, State and local levels. This is not much compared to enforcement of the Clean Air Act, which has 15 000 people working on it. The administrative costs have also been low because a trade within the trading scheme does not require the authority's approval. Additionally, the transaction costs have been low. The program has also encouraged technical and market innovations. (Määttä 2000, 54-59.)

The success of the Acid Rain Program offers a model for planning a trading scheme. According to the EPA, the following options should be considered in the preparation of emissions trading legislation:

"Lessons learned:
- Market-based instruments are tools: define the problem, set goals, and design an appropriate program:
  - Keep the system as simple as possible
  - Set an emissions budget for an entire source category (avoid partial participation)
  - Assure accountability before allowing flexibility"

"Government should focus on:
- Setting the goals
- Establishing the rules, including initial allocation of emission-reduction responsibilities
- Collecting and verifying emissions data
- Recording compliance transfers
- Enforcing the rules; assuring consequences for non-compliance"

"Government should refrain from:
- Assuring market functions
- Reviewing or approving individual allowance transfers
- Reallocating allowances frequently
- Requiring specific technologies or measures" (Määttä 2000, 59)

V.3.2 Danish CO_2 Emissions Trading Scheme

In the EU burden-sharing agreement Denmark committed itself to a 21 % reduction of GHG emissions. In order to fulfil this commitment the Danish Parliament in 1999 adopted a trading scheme for the period 2000–2003. This cap and trade scheme started in January 2000. The scheme sets total

quotas for CO_2 emissions for the electricity producers and issues emission allowances for the individual power companies. (Pedersen 2000.)

The total CO_2 quota is 23 million tonnes in 2000. This will be reduced by 1 million tonnes per year, to reach a quota of 20 million tonnes in 2003. The allowances are issued per company, not per unit or per plant. The scheme covers all electricity producers in Denmark, except producers relying entirely on renewable energy and small producers, with historical CO_2 emission less than 100 000 tonnes, but only if electricity is produced as combined heat and power (CHP). As a result, the scheme covers around 15 producers and 90 % of the total CO_2 emissions. The exemption reduces the transaction costs for a number of small producers who have already – through the establishment of an efficient CHP plant – contributed to the CO_2 reductions and have only limited scope for further CO_2 reductions. These small CHP producers do not receive an emission allowance and they do not have to pay the penalty in case of non-compliance. The CO_2 emissions from the small producers (1.9 million tonnes) is taken into account in determining of the total number of allowances to be distributed to the installations participating in the scheme, to ensure that the total emission allowances and the contribution from the exempted small producers do not exceed the total quota. (Pedersen 2000.)

The grandfathering principle was applied to the initial allocation of allowances, which was based on emissions in the period 1994–1998. This principle was chosen because the existing electricity producers had already invested in their power plants under the old system without anticipation of CO_2 quotas; some of these investments might not even have been made under the trading scheme. Furthermore, the principle introduces only a small distortion into the initial competitiveness of electricity companies; therefore, the companies find it more acceptable. The Commission's view is that grandfathering is state aid, because a new producer in Denmark, who has no allowances and will have to buy them from the market, will be discriminated against compared to the existing producers, who have received free emission allowances through the grandfathering principle. As a consequence, the Commission's approval of the Danish Quota Act, given in April 2000, presupposes that new producers will be provided with emission allowances according to objective and non-discriminatory conditions, if such producers should come on stream before the end of 2003. (Pedersen 2000.)

The monitoring is based on continuous monitoring of the fuel consumption of each electricity and heat producing plant in Denmark. The CO_2 emissions are calculated by multiplying fuel consumption with a standard value for CO_2 content. The emissions are reported annually to the Danish Energy Agency. A continuous and online reporting system, like the one under the U.S. Acid Rain Program, is not required. The trading is done by the producers without government interference and registered with the Danish Energy Agency. The Danish Energy Agency has to be informed no later than four weeks after any trade. The allowances can also be banked for future use or trade. In 2001 three trades were reported under the Act with a total volume of 160 000 tonnes of CO_2. (Pedersen 2000 and 2001.) The low market activity is the result of the allocation of allowances, because in the Danish permit market, two participants (Energi E2 A/S and Elsam A/S) hold allowances that cover over 80 % of the total emissions. The Table V.1 below shows the final allocations for 2001 and 2002 and the preliminary allocations for 2003, before trading. For comparison, the historical average annual CO_2 emissions in the "grandfathering period", 1994–1998, were 30.3 million tonnes.

TABLE V.1. Allocation of allowances 2001–2003; million tonnes of CO_2 (Pedersen 2001).

Producer	**Final allocation**	**Final allocation**	**Preliminary allocation**
	2001	**2002**	**2003**
Energi E2 A/S	8.221	7.577	7.135
Elsam A/S	10.533	9.873	9.420
EON/PreussenElektra	0.965	0.838	0.751
I/S Avedøreværket 2	0.094	0.527	0.510
Østkraft Produktion A/ S	0.062	0.060	0.058
Energi Randers Prod. A/S	0.198	0.198	0.198
Dansk Shell A/S	0.102	0.102	0.102
NRGI Amba (Anholt)	0.001	0.001	0.001
Without permits	1.825	1.825	1.825
Total cap	**22.000**	**21.000**	**20.000**

If an electricity producer exceeds the emission allowance, taking into account traded and banked CO_2 emission allowances he must pay a fixed penalty of DKK 40 (about USD 5) per tonne of CO_2 emitted in excess of the allowance to the government. The revenues from the penalties are to be used for investments in energy savings. (Pedersen 2000.)

V.3.3 UK Emissions Trading Scheme

Under the Kyoto Protocol and the EU burden-sharing agreement, the United Kingdom needs to reduce GHG emissions by 12.5 % below the 1990 levels by 2010. The United Kingdom's Climate Change Programme sets out policies to reduce GHG emissions from business and other sectors. The voluntary trading scheme is a key element of this policy. The Government published the Draft Framework Document in May 2001. The proposed design is quite complex, resulting from the need to maintain consistency with other elements of UK climate change policy. It contains two, but partially linked, emissions trading markets: "baseline and credit", made possible under Climate Change Levy (CCL) Agreements, and "cap and trade", originally proposed by the industry-led UK Emission Trading Group. Thus, companies can become eligible to trade either by agreeing targets for reducing emissions with the government or by participating in an auction of allowances. The revised formal start-up date is April 2002. (Kitamori 2001, 12.)

The CCL is a new energy tax that has been introduced as of April 2001 on energy consumption by industry and business. Energy-intensive industrial sectors may be eligible for a discount of 80 % on the CCL if they enter into CCL Agreements (CCLAs), which are the voluntary agreements for committing to certain "challenging" emission reduction targets. Only those sectors that are covered by the IPPC directive are eligible to negotiate CCLAs. Under the CCLAs, a firm can choose either of two emission reduction targets: an absolute target for CO_2 emissions, or a unit target, that is, an energy efficiency target per unit of output. With a baseline target, a firm will be credited for the portion above and beyond the agreed baseline, and these credits can be traded. Absolute targets under the CCLAs are also eligible to be used in an Emission Trading Scheme (ETS) discussed below, while firms choosing unit targets can only trade credits among themselves. The "relative sector" with unit targets can purchase permits from the ETS without limit, but credits from unit targets can only be traded with the "absolute sector", the ETS, if there has been a previous purchase of allowances from the ETS by another unit sector. (Kitamori 2001, 13–14.)

The ETS is a voluntary programme, with four main ways to enter:

- From outside the scope of the CCLAs, with voluntary and absolute targets ("direct participants").
- Through the "gateway" with relative, or in some cases with absolute, targets under the CCLAs.
- By emission-reduction projects (credit trading).
- By opening an account in the registry to buy and sell allowances.

Thereby, the UK scheme, in theory, covers the whole economy because it is open to any installation wishing to participate and able to comply with the rules of the scheme concerning monitoring and reporting. The scheme also covers all six greenhouse gases controlled under the Kyoto Protocol, but the participating firm can choose either a cap on CO_2 only or on all the Kyoto greenhouse gases. As the ETS is voluntary and the participants have to also pay the CCL on their energy consumption, the government has allocated £30 million (available from 2003–2004) for incentive payments for participants who agree to voluntary binding and challenging reduction targets in the auctions. However, those participants that are already covered under the CCLAs and therefore eligible to receive the 80 % discount on the CCL would not be able to receive the incentive payments. (DEFRA 2001, 2–4.) The structure of the UK Emission Trading Scheme is illustrated in Figure V.3.

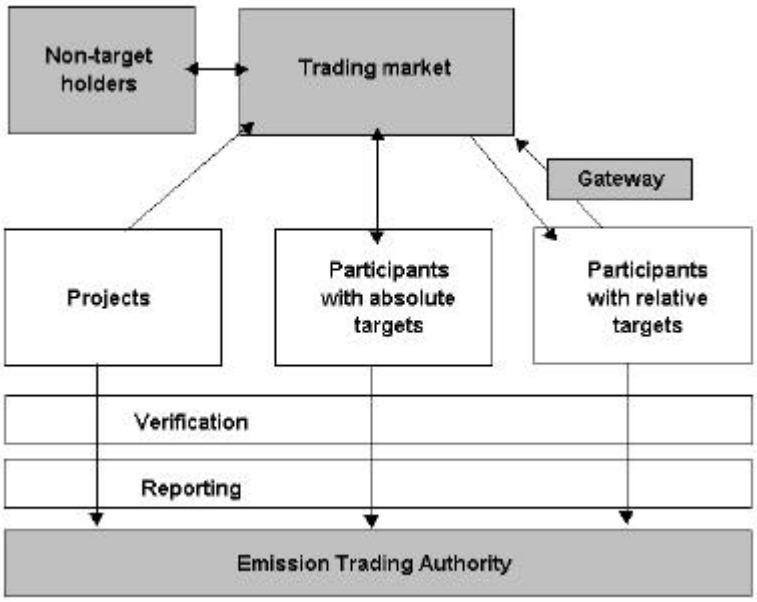

FIGURE V.3. Structure of the UK emission trading scheme (DEFRA 2001, 4).

The first auction for the direct participants was completed on 11–12 March 2002 and was, according to the UK environment ministry, an enormous success. Thirty-four firms have pledged to cut annual CO_2 emissions by over 4 million tonnes over the next five years. This is over 5 % of the planned reduction in the United Kingdom's annual emissions by 2010. (ENDS Daily 13.3.2002.) Organisations that receive the incentive payment have a cap for emissions and the allowances will be grandfathered to these organisations. Organisations under the CCLAs will receive allowances only if they beat their targets and will have to buy extra allowances if they do not achieve their targets. Thus, the UK scheme includes both 'cap and trade' and 'baseline and credit' trading. (DEFRA 2001, 5.)

Allowances are recorded on a computerised registry. The "direct participants" have to be in compliance in order to get the incentive payment and a full allocation of allowances next year (DEFRA 2001, 6). If a firm under the CCLA with a binding reduction target does not meet this target, it is subject to a penalty. The firm will lose its eligibility for the 80 % discount on the CCL in the next period and will also be required to repay the discount it received in the previous period. (Kitamori 2001, 14.)

Banking is allowed without restrictions up to the end of 2007. Moreover, participants with absolute targets will be able to bank surplus allowances into the First Commitment Period (2008–2012) under the international trading scheme. The UK trading scheme is also envisioned to recognise credits from joint implementation (JI) and clean development mechanism (CDM), once clear rules have been established. (DEFRA 2001, 6; Kitamori 2001, 13–15.)

Even though the scheme will formally be launched in April 2002, the credit system has been boosted by the announcement of a first inter-company deal. The chemical firm DuPont has sold 10 000 tonnes of CO_2 equivalent allowances for 2002 to Mieco of Japan. DuPont and Mieco are both seeking to gain through the deal early experiences in emissions trading, according to the broker, Natsource. Natsource has identified about 60 inter-company trades around the world in a recent study for the World Bank, but the DuPont-Mieco deal is unique because it takes place in anticipation of gaining credits under a government-backed trading scheme. (ENDS Daily 24.9.2001.)

The government will carry out a thorough review of the scheme in 2005, according to the draft proposals released on 3 May 2001. Any necessary changes to the scheme could then be implemented in 2007, when the first round of participants will be expected to have achieved their emission reduction targets. Further consideration also must be given to how the scheme has to be changed to be compatible with the EU-wide scheme, because the UK scheme is based on use, unlike the EU's.

V.4 IMPLEMENTATION OPTIONS OF A TRADING SCHEME

V.4.1 Defining the tradable unit

In order to reach economic efficiency, all allowances traded under the EU trading system are interchangeable, regardless of their origin or who is selling them. Thus, a single definition of an allowance is important. (Design of… 1999, 9.)

In the EU-wide scheme there will be a difference between "a permit" and "an allowance". The GHG permit will be required by all installations covered by the scheme. The permit will set obligations to hold allowances equal to the amount of actual emissions, and to monitor and report emissions. The allowances will be transferable, but the permits will be attached to a specific installation. According to the proposal, each allowance would represent one tonne of CO_2-equivalent. (Commission… 2001, 3.)

In the preliminary phase, allowances will have validity not extending beyond the end of the phase, and after that not beyond the subsequent five-year period in which they are issued. This also makes banking within periods possible. To increase temporal flexibility and to encourage early reductions beyond the Kyoto target, the same number of allowances that a participant has banked for a previous period will be issued to that participant at the beginning of each period. Even if a Member State

is not in compliance with its commitments, the holders of extra allowances will not lose the benefit of obtaining the surplus. (Boemare and Quirion 2001, 11; Commission… 2001, 12–13.)

V.4.2 'Baseline' and 'cap and trade' systems

In the EU, the focus is on the cap and trade programme. A strict environmental goal can be achieved better under a cap and trade system, as the total amount of emissions is limited to the desired level and there is a rather strong certainty about the environmental outcome. (Solomon 1999, 384–385.) In addition, the cap and trade scheme tends to have lower transaction costs (Egenhofer 2001, 36). However, in the preliminary phase, 2005–2007, there will be no binding targets limiting the emissions of the Member States. The penalty for non-compliance will also be lower and the allowances will be allocated free of charge. (Commission… 2001, 3.) After the preliminary phase, a new five-year period commences that coincides with the commitment period of the Kyoto Protocol.

V.4.3 Allocation and issuance of allowances

Grandfathering has been considered an advantageous practice to allocate allowances, as it theoretically enables dynamic efficiency. However, there is no guarantee that the participants will use the savings resulting from the free allocation to develop new technology. On the other hand, grandfathering means a capital transfer to the polluters. This is not in accordance with the polluter pays principle. (Koutstaal 1997, 10.) In addition, grandfathering does not encourage firms to invest in abatement technology, if the allowances are allocated based on earlier emissions, as those firms that have not made early investments in cleaner technology will get more allowances. This effect can be avoided by basing the allocation on energy efficiency so that efficient firms get more allowances. Grandfathering also creates a bias against new firms entering the market, if established firms get their permits free while the new ones have to buy them unless some allowances are put aside. (Boemare and Quirion 2001, 8). However, it has to be taken into account that no matter what the initial allocation, efficiency can be achieved.

On one hand, the auction may be problematic as firms are often opposed to it because they think it weakens their international competitiveness, and the implementation of the trading scheme can be entirely impeded. On the other hand, the auction is preferred as the auction revenues can be recycled in the society. However, the purpose of the auction should not be for the benefit of the government, because this could obscure the meaning of the trading scheme. In addition, the auction allocates the allowances efficiently right from the starting point and there is no need to trade at the beginning of the scheme and there are no additional transaction costs. (Koutstaal 1997, 10.)

In the EU-wide trading scheme each Member State will allocate its allowances taking into account the requirements of the emissions trading directive, the EU Burden Sharing Agreement and the Kyoto Protocol. Although, according to studies, grandfathering is a second-best solution and at the installation level, allowances must be auctioned and revenues recycled (FIELD 2000, 5), the proposed directive requires that in the preliminary phase of 2005–2007 the Member States allocate allowances for free. To ensure fairness and protect the internal market this should be done based on objective and transparent criteria. Member States are required to ensure that new entrants have adequate access to allowances. Member States would also have to communicate to the Commission their allocation plan in advance. The plan will be rejected if the common criteria are not fulfilled. The allocation issue is considered in further detail in the study for Directorate-General for the Environment (NERA 2002). The plans give relevant information on how Member States are planning to

meet their commitments and thus improve the quality of and access to information. The experiences from the preliminary period will be reviewed by 30 June 2006 to determine the method that should be used in future. (Commission… 2001, 11, 15)

The number of allowances issued will be left to the Member States to decide and will not necessarily be less than past emissions. But the Member States will still not be allowed to issue extra allowances to a sector or installation and they will have to take into account the technological potential to reduce CO_2 emissions. This last aspect is interesting as it resembles the best available technology (BAT) approach of the IPPC directive. (Commission… 2001, 7.)

V.4.4 Scope: sectors to include in trading

A trading scheme covering all Member States would provide the best guarantee for a smooth-functioning internal emissions market as compared to a set of uncoordinated national emissions trading schemes (Commission… 2000, 4). In the EU-wide scheme, trading by governments is not the most efficient form of trading. It equates only national marginal costs but not costs across sources within each country, and prevents some cost-effective domestic reduction opportunities from being available on the world market. (Center… 1999, 20; FIELD 2000, 16.) The potential savings from a trading scheme increase with the coverage of the scheme, because the market efficiency requires a sufficient number of actors in the permit market. Only then can marginal costs between actors become equal. Therefore, the EU-wide scheme is to be implemented with trading at the installation (firm) level. The EU-wide scheme would also lead to one single price for allowances traded by companies, thereby ensuring a level playing field for all.

One of the key issues in developing an EU-wide trading scheme is the sectors and sources that should be included. In making this decision a number of criteria need to be considered, including (Center… 1999, 23–24):

- Environmental effectiveness. It is desirable to include as many sources as possible in the trading scheme, because a cap and trade system imposes an absolute emission limit and therefore offers greater certainty of desired environmental outcome than non-trading policies and measures.
- Economic efficiency. Capturing more sources and a higher percentage of total emissions in the trading scheme will reduce the overall cost of CO_2 control, especially when the marginal costs of mitigation differ widely among sources and industries (Center… 1999, 23–24). If each country implements its target under the Burden Sharing Agreement individually, the total annual cost for the EU to reach the Kyoto target will be € 9.0 billion. If only energy suppliers participate in the emissions trading scheme the annual cost will be € 7.2 billion. If energy intensive industries (iron and steel, non-ferrous metals, construction materials, chemicals and paper and pulp industries) are also included the cost would be € 6.9 billion. If all sectors were included, the cost would be only € 6.0 billion (see Figure V.4). (Capros and Mantzos 2000, 1.)

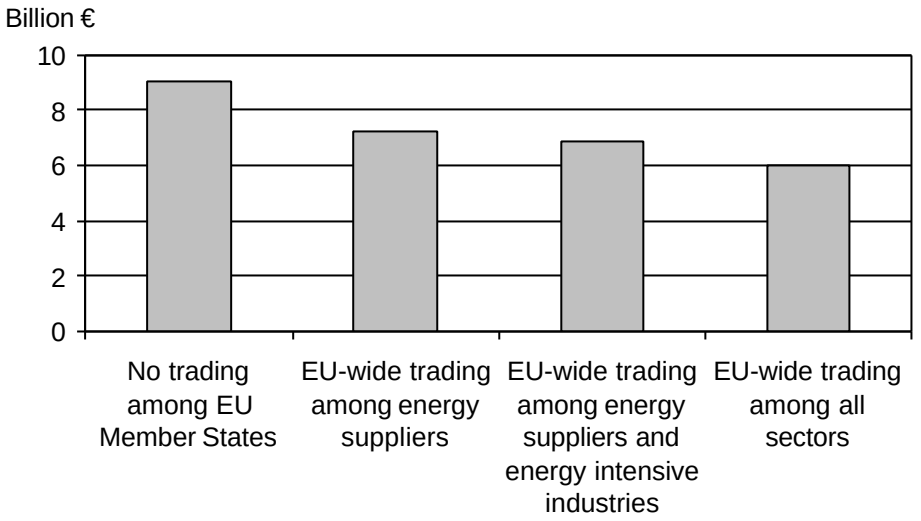

FIGURE V.4. Costs of reaching the Kyoto target to EU Member States in 2010 (billion €) (Capros and Mantzos 2000, 1).

- Effects on competition. Ideally, the competing firms and industries face the same marginal cost of control. This can be achieved by designing such an overall control strategy that firms and industries which compete with one another are either both included or excluded from trading.
- Administrative burden. The scheme should be designed so that the costs to government of administering the scheme are manageable. Tasks include maintenance of a registry, verification of emissions reports, distribution of allowances and enforcing penalties for non-compliance. Also, the monitoring and reporting burden placed on the sources should be manageable.
- Relationship to other policies and measures (PAMs). From strictly an environmental perspective, the trading scheme need not cover sectors already regulated through PAMs. From an economic perspective, the relationship between trading and PAMs is important because PAMs reduce the efficiency of trading by forcing reductions in particular sectors.

According to the proposed directive, the EU trading scheme would initially cover only CO_2 emissions and would be restricted to the most significant CO_2-emitting installations under the IPPC legislation, and to combustion and power plants with thermal capacity over 20 MW but under 50 MW. These installations are included as they are major sources of CO_2 emissions and their number is likely to increase in the future. (Environment DG 2002.) This would result in coverage of approximately 46 % of the EU's estimated CO_2 emissions in 2010, and of 4 000 to 5 000 installations. Chemical plants and waste incinerators would be excluded. The chemical plants would not be included because to do so would increase the administrative complexity of the scheme. The CO_2 emissions of chemical plants are insignificant (less than 1 % of the total emissions of EU) and the number of plants is high (34 000). Waste incinerators are excluded because of the complexities in measuring the carbon content of the waste material. The Member States would be able to propose other sectors for inclusion in the scheme. (Commission… 2001, 10.)

V.4.5 Monitoring, reporting and compliance

A trading scheme could be organised with varying degrees of Community intervention. A scheme requires a certain level of regulation and it would appear to go beyond the minimum level of Community intervention as many of the adverse competition effects and barriers to trade can be avoided through implementation of a somewhat centralised trading scheme for selected sectors. The European Commission believes that a Community approach is necessary to ensure that competition is not distorted within the internal market. Two important questions are: How important are the Community's fair competition rules in the context of implementation of the Kyoto Protocol? Do these threats to competition justify giving the Community a major role in trading and allocation decisions? (Center… 1999, 22; Commission… 2000, 5.)

The intensity and environmental effectiveness of any trading scheme will largely depend upon its compliance provisions and enforcement regime. To be effective, a trading scheme necessitates a certain degree of harmonisation of the rules of monitoring, reporting and verification at the EU level, and a strong role for the European Commission. The elements that would benefit most from Community harmonisation are: the common unit of trade; criteria for the participation of installations; and a framework for the distribution of emissions allowances to prevent distortions of competition, and for monitoring, compliance (verification) and enforcement. Without these factors the attractive features of emission trading cannot be realised in practice. (FIELD 2000, 20–21; Center 2001, 2.) For example, in the United States many trading schemes have failed because of weak monitoring systems, even for uniformly mixed pollutants like volatile organic compounds (VOCs). On the other hand, the success of the U.S. SO_2 trading scheme results largely from the strictness of the enforcement regime, including stiff penalties for non-compliance. (Commission… 2000, 9, 25; Solomon 1999, 372.)

The Member States have agreed to fulfil the Kyoto commitments jointly. This strengthens the proactive, supervisory and assessment role of the Community. On the other hand, the lack of binding commitments for the pre-2008 period could provide a justification for a weaker Community role. Currently, the Community's role in assessing the Member State compliance with their obligations is based on the Monitoring Decision (Council Decision 93/389/EEC; FIELD 2000, 20–21.) The proposed directive takes into account the principle of subsidiarity and, where appropriate, the decisions are left to the Member States. The directive contains only basic principles for monitoring, reporting and compliance criteria.

The justifiability of a trading scheme depends partly on the set of available technologies for monitoring and enforcement. Questions about the ability to monitor emissions have played an important role in the design of emissions trading schemes. Continuous monitoring is often infeasible due to technological and economic constraints. Regulators usually estimate emissions based on assumptions about the typical parameters of a manufacturing process, operating hours, and the effectiveness of pollution control equipment. Absent trading, the difficulty of monitoring emissions creates uncertainty about the allowance limits necessary to attain standards. When trading is introduced into the regulatory system, the difficulty of monitoring emissions creates ambiguities about property rights to which firms are entitled and whether those property rights are "in use" or available for trading. (Hahn and Hester 1989, 403.)

The main Community instrument for the monitoring of GHG emissions by the Member States is the Monitoring Mechanism (Council Decision 93/389/EEC). The mechanism is designed to monitor all anthropogenic greenhouse gases in the Member States not controlled by the Montreal Protocol and to ensure compliance with the Community's commitments concerning climate change. It contains a

number of elements that may be important for the operation of the trading scheme, including national programmes, annual reports and annual evaluation reports. The linked national registries are a crucial part of the Monitoring Mechanism. (Center… 1999, 34.)

The draft directive does not propose a central body to organise carbon exchange and it allows direct bilateral trade without administrative approval but with mandatory registration. A central administration will be established to act as a "policeman" for the national registries to assess whether a country is in compliance with the Kyoto commitment. The detailed rules for national registries are not yet determined, as they will be adopted by a separate European Commission regulation. (Commission… 2001, 13, 17.)

At the national level companies would have to monitor and report to national authorities their emission monitoring results and emissions trading activities. The monitoring results should be communicated to the European Commission. The reporting requirements ensure that the transparency requirements are fulfilled and the Commission is able to control anti-competitive behaviour, abuse of dominant position and restrictions to market access (Commission… 2001, 6). The European Council and the European Parliament adopted on 4 April 2001 a Recommendation providing for minimum criteria for environmental inspections in the Member States (Official Journal… 2001). It is not clear if this recommendation could serve as a basis for a verification regime for a trading scheme. (Center… 1999, 34.)

The reporting requirements and national registries will ensure transparency. This improves the Commission's capacity to control the operation of the scheme in respect of State Aid, competitiveness of the permit market and restrictions to market access. Additionally, the public should have access to information concerning the results of the monitoring, reporting and compliance and information on national registries. This should be in accordance with directive 90/313/EEC on the freedom of access to information on the environment. Transparency requirements and access to information should be consistent with the Aarhus Convention and with the proposal for the directive concerning public participation in certain plans and programmes relating to the environment (COM(2002)839). (Commission… 2001, 5, 15.)

The IPPC directive can be used as a basis for developing basic monitoring and measurement guidelines. Another alternative would be to elaborate minimum monitoring requirements through the Large Combustion Plant Directive (LCPD). (Center… 1999, 31–35; Commission… 2000, 25; Center… 2001, 3.) The European Pollutant Emissions Register (EPER)[2] can also be used in monitoring and reporting. The Commission would be required to report annually the operation of the scheme, nine months after every commitment period. The Commission will also organise the exchange of information between the competent authorities of the Member States. (Commission… 2001, 15.) According to Boemare and Quirion (2001, 2) further guidance at the EU level is still needed.

The draft directive suggests that the penalty fee would be € 100 per excess tonne or twice the market value of an allowance in a predetermined period, whichever is higher, if a firm would not keep its emissions within its allowances. In the preliminary period the penalty fee would be € 50 or twice the market price, whichever is higher. (Commission… 2001, 14.) The penalty fee seems to be so high that it makes no sense for an operator to release emissions without allowances to cover those emissions (Boemare and Quirion 2001, 2).

[2] Commission Decision of 17 July 2000 on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/91/EC concerning integrated pollution prevention and control (IPPC).

V.4.6 Integration with other policies and measures: the IPPC directive

Emissions trading is a relatively new policy tool compared to other economic instruments, traditional command-and-control measures and voluntary approaches in general, and in particular compared to domestic climate change policy tools in most countries. By packaging multiple policy tools, it could mean undermining the potential efficiency of them individually, and even the wasteful use of instruments and higher administrative costs. Mixing emissions trading and other instruments could also cause a problem of equity between the firms covered by a trading scheme and the firms that are outside it, as different instruments would most likely create differing marginal costs. (Kitamori 2001, 23.) Instruments can be incompatible also when they impose double burdens on emissions from particular sources. However, they can be particularly compatible when there are legislative or administrative elements that might be used for emissions trading. (Center… 1999, 43.) If a single instrument can not achieve the given environmental outcome more effectively, and if instruments supplement each other in a predictable way, it is possible to combine a trading scheme with other instruments in a cost-effective way. (Kitamori 2001, 23.)

The EU-wide emissions trading scheme needs to be integrated with a number of other policies and measures which have been developed over time and which form the current Community strategy on climate change. The EU-wide trading scheme should also be compatible with international and national emissions trading schemes. This requires an agreement between Member States to mutually recognise the allowances under each scheme. (Commission… 2001, 16.) The proposed directive takes into account possible synergies with existing legislation. In this report the key issue is the linkage to the IPPC directive, which has also been studied in the non-paper of the Environment DG (D(02)610019).

According to the Environment DG (2002), the trading scheme will affect the implementation of the IPPC directive, as the emissions trading would apply to most of the significant greenhouse gas-emitting activities, which are already covered by the IPPC directive. In addition to the activities covered by the directive, combustion and power plants with thermal capacity over 20 MW but under 50 MW will also be included (see Section V.4.4). The linkage between the EU-wide trading scheme and the IPPC directive is highly complex, but there are also some synergies like a possibility to use the directive as a legislative basis for introducing trading. For example, the definitions of "operator" and "installation" used in the emissions trading proposal are based on those in the IPPC directive. (Environment DG 2002.) Additionally, Member States' competent authorities that grant the GHG permits could be the same as those implementing the IPPC directive. Thus, for activities covered under the IPPC directive, the GHG permit could be issued through a single procedure in accordance with the IPPC permit procedure. (Commission… 2001, 10.) National permit authorities should already have most of the resources and skills required to manage the issuing, monitoring, verification and compliance assessment. However, the proposed directive does not oblige the Member States to combine these procedures, but only requires them to co-ordinate the conditions of, and procedures for the issuing of GHG and IPPC permits. The GHG permits need not be issued at the same time as an IPPC permit, but the competent authorities for the IPPC permit must be consulted, as "…the information required for an IPPC permit will tend to include the information required for an emission trading permit, and it would be useful for the relevant authorities to be able to check the consistency of the application." (Environment DG 2002.)

The IPPC directive obliges particular industrial activities to obtain permits that include emission limit values (ELVs). The IPPC directive does not explicitly list any of the greenhouse gases, but the list of substances is only indicative, requiring the permit to include emission limit values for pollutants "likely to be emitted from the installation concerned in significant quantities". The Member

States may thus include GHG emissions in their implementation of the directive, and are even forced to do so if the emissions are significant. According to the non-paper of the Environment DG (2002), "CO_2 falls within the IPPC Directive's broad definition of pollution" [3].

The IPPC directive mentions energy efficiency but does not define it explicitly, although the directive states "requires competent authorities to take into account the basic obligation of the operator to use energy efficiently when determining the conditions of the IPPC permit." (Environment DG 2002.) It is thus difficult to determine if the installation is using energy efficiently enough to credits or allowances beyond a baseline or a cap (Center… 1999, 43–44). But according to the Environment DG (2002) this common level of effort for energy efficiency is not expected to be problematic.

The Member States are obligated under the IPPC directive to ensure that installations are implementing best available techniques (BATs) in preventing pollution. The competent authorities must set the emission limit values (ELVs) based on BATs. (Environment DG 2002.) The ELVs of the IPPC directive can also be considered a basis for the allocation (grandfathering) of allowances (Center… 43–45). In the proposed trading scheme directive it is said that the Member States should take into account the technological potential of installations to reduce their greenhouse gas emissions. (Commission… 2001, 11.)

If the installation was covered by both the IPPC directive and the trading scheme, the ELVs for greenhouse gases would reduce the cost-effectiveness of an emissions trading scheme through requiring specific levels of reduction at some plants. To ensure flexibility through the option of trading the proposed directive adds a paragraph to the IPPC directive that says that when an installation covered by trading scheme releases a greenhouse gas "…the IPPC permit should not include an emission limit value for direct emissions of that gas unless it is necessary to ensure that no significant local pollution is caused. Where necessary, the competent authorities shall amend the permit to remove the emission limit value." (Commission… 2001, 29.)

Monitoring, verification and enforcement requirements should be harmonised between the trading scheme and the IPPC directive. As said in the previous section the IPPC directive could be used as a basis for developing basic monitoring and measurement guidelines. However, allowances should be defined differently from IPPC emission limits because GHG emissions cannot be included in an integrated permit if the allowance is to remain tradable. (Center… 1999, 43–45, 52.)

V.5 CONCLUSIONS

This chapter presents options that could be taken into account in the design of an EU-wide trading scheme. Not only the key features concerning such a trading scheme, but also the integration of the scheme with other policies and measures, especially the IPPC directive, have been studied. The key features concerning the implementation of an EU-wide trading scheme, as outlined here, are as follows.

In order to create an efficient and competitive market:

[3] The IPPC directive, Article 2(2) defines pollution as "the direct or indirect introduction as a result of human activity of substances, vibrations, heat or noise into the air, water or land which may be harmful to human health or the quality of the environment, result damage to material property, or impair or interfere with amenities and other legitimate uses of the environment".

- Single definition of tradable unit is necessary.
- Trading should be organised by emissions sources rather than governments. Therefore, the scheme provides broad coverage of the installations that are the main sources of CO_2 emissions and also a sufficient number of installations in order to maintain market efficiency.

Scope of the scheme:

- The scope of the EU-wide scheme will be determined through the IPPC directive and the Kyoto Protocol.
- The scope would be initially restricted to installations under the IPPC legislation (chemical and waste incinerators would be excluded) emitting significant levels of CO_2, and in addition to combustion and power plants with thermal capacity over 20 MW but under 50 MW. In 2004 the Commission may make a proposal to amend Annex I of the proposed directive to include other activities.
- The proposal for the scheme initially covers only CO_2 emissions. In 2004 the Commission may make a proposal to include other gases listed in Annex II of the proposed directive.

Allocation of allowances:

- The number of allowances to be allocated in the trading scheme in aggregate is based on the Kyoto commitment and the number of allowances allocated to the Member States is based on the Burden Sharing Agreement.
- The Member States should control the distribution of allowances to emission sources taking into account certain additional requirements of the emissions trading directive.
- In the preliminary phase, 2005–2007, the allowances are allocated for free according to the Commission's proposal. The method to be used in future will be determined later based on the experiences of the preliminary phase.

To ensure the compliance of Member States and installations:

- Both trading and the holding of allowances will be recorded in national registries.
- Monitoring, reporting and compliance requirements will be harmonised at some level. The scheme should oblige Member States to monitor and verify reported emissions based on common rules (Community guidelines or use of existing Community policies to establish these rules).
- Financial penalties for non-compliance are necessary.

To ensure transparency and access to information:

- Transparency and access to information should be consistent with the Aarhus Convention and the proposal for the directive concerning public participation in certain plans and programmes relating to the environment (COM(2002)839).
- Allocation methods should be transparent, because they give relevant information about actions that Member States are taking to meet the Kyoto commitments.
- The public should have access to information concerning reporting, monitoring and compliance.
- National registries and information on holdings in these registries should be open to the public.

Compatibility with other policies and measures

The EU-wide trading scheme has to be combined with other instruments and legislation, without undermining the efficiency of a single instrument. Wasteful and overlapping use of instruments creates higher administrative costs and thus decreases the efficiency of the instruments.

The linkage between the EU-wide trading scheme and the IPPC directive is highly complex, and it has not been widely studied. The main conclusion is that the approaches in permitting and emissions trading are somewhat incompatible, and thus, in some cases, the IPPC directive should be amended to remove the emissions limit values of gases covered by the trading scheme. It is also possible to use the IPPC directive and the ELVs as the legislative basis for implementing the trading scheme. These viewpoints and revisions make these two instruments work more smoothly together as a compatible and efficient policy mix.

Nevertheless, there are several questions to be resolved before the final emissions trading directive is implemented in practice. These questions become even more difficult as the implementation schedule is quite stringent and the scheme should be implemented from the beginning of 2005. These questions and the fact that the implementation necessitates not only the practical solutions but also an approval of them by Member States, sectoral interest groups and the Commission make determined actions essential both at the EU and the Member State levels. These complexities create challenging questions for the future considerations of the implementation of trading schemes, both in the international and national contexts, for policy mixes and for the linkage between permitting and emissions trading.

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