

European Union Network for  
the Implementation and Enforcement  
of Environmental Law

# **Energy Efficiency in Permitting and Inspections**

## **Final report**

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# FOREWORD

## Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the EU Member States, acceding and candidate countries of the European Union and EEA countries. The association is registered in Belgium and its legal seat is in Bruxelles, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. 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. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 6th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at:  
[www.impel.eu](http://www.impel.eu)

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## EXECUTIVE SUMMARY

A first IMPEL project on energy efficiency was carried out in 2002 with Finland as lead county. After eight years and the development of the horizontal BREF document on “Energy Efficiency” IMPEL had identified that the item of energy efficiency in permitting and inspection needed to be explored again. The ToR for the project was adopted by the Extraordinary General Assembly of the network in October 2009.

The main objectives of the project were:

- to explore how Member States have implemented in practice the energy efficiency provisions of the IPPC directive and handle obstacles;
- to identify how Member States enforce their legal requirements in this field;
- to find out what kind of information is required in permit applications e.g. energy efficiency indicators;
- to analyse how Member States work with the BREF Energy Efficiency and information of other BREFs related to energy efficiency;
- exchange of information on existing guidance material;
- to find out what is needed most to support Member States in the enforcement;
- to find out which project IMPEL can carry out in the field of energy efficiency and climate change;

Another aim was to find out whether alternative instruments such as voluntary agreements, environmental management systems, emission trading schemes and taxes produce already improvements in the energy efficiency performance of sites to such a degree that it might not be necessary to deal with the item in IPPC permitting and inspection. Due to the lack of systematically generated data this question could not be answered in the project.

In this project the following good practices were identified in relation to dealing with energy efficiency in permitting and inspection:

- Good guidance on energy efficiency (horizontal and sector specific)
- Beforehand discussions and application forms with specific requirements concerning information on energy efficiency

- Good and enforceable permit conditions concerning energy efficiency (concerning measures, monitoring and reporting etc)
- Adequate self monitoring
- Performance of energy audits and implementation of energy efficiency management systems is considered as BAT.
- Good cooperation through involvement of energy agencies or other authorities in the permitting procedures
- Voluntary measures such as energy management systems, voluntary agreements, eco tax systems and incentives have a positive impact on the energy efficiency performance of sites.
- It is good practice to provide good working material and training for environmental authorities.

The project showed that these good practices are not in yet place in many member states.

The results of the evaluation of the current situation in Member States indicated 7 main challenges. These challenges should be addressed in the nearest future to increase the quality of the IPPC permits and to increase energy efficiency:

- a. Legal background – In the current IPPC directive it is not explicitly stipulated how energy efficiency is defined or should be addressed. However it is quite clear that BAT shall be used not only for emissions and waste prevention and minimisation but also for energy efficiency. The situation will be slightly improved in the future IE directive but not clearly enough. The requirements have been implemented in different ways in Member States. As a special case, realisation of combined heat and power is not always possible because of local reasons (e.g. whether the use of surplus heat is possible). Some (existing) industrial sites cannot fulfil this goal; however the application cannot be rejected on the basis of suboptimal site conditions; requirements for land-use planning (e.g. local, regional energy concepts) could be an option.
- b. Sector specific BREFs have until now not been concrete and precise enough regarding energy efficiency - although the horizontal BREF on energy efficiency techniques includes all major techniques to implement energy efficiency. However, to date this document has not been utilised much. The horizontal BREF on energy efficiency has been used mainly as a check list. It would be more user-friendly to incorporate the energy efficiency issues in the sector specific BREFs. The Guidance document on collection of data for the BREF work, IEF 20/4, emphasizes the need to improve the collection of data on energy aiming at BAT conclusion given e.g. as GJ/tonne of product.
- c. Lack of expertise in technical energy efficiency in authorities and companies – Many authorities do not have the technical expertise to check the energy efficiency in detail. This means that operators must be very clear and comprehensive in their discussions with authorities and in their applications for permits.
- d. Lacking or only occasional cooperation between energy and environmental authorities or organisations which have specific knowledge in energy efficiency;
- e. Permit revision – In many Member States there is no general approach to handle the item of energy efficiency in the permit revision. The individual legal background in the countries sometimes makes it difficult to consider energy efficiency in the procedure. It remained unclear whether in case of alterations of installations the overall efficiency will be assessed or only the efficiency of the changed part.
- f. System boundaries and benchmarking - Defining the “system” and the resulting benchmark is a challenge. There is lot of information related to that in the BREF “Energy Efficiency”. However: Due to site specific solutions it might at least for some installations be burdensome to compare the performance with available benchmarks. Concerning the system boundary the legal definition of an IPPC installation is rather narrow and does not extend to third parties.

- g. Unclear influence of environmental management systems, voluntary agreements, tax- and more profoundly, the overlap with the EU Emission Trading Scheme on energy efficiency - It is often assumed that the effects of measures carried out under these systems produce improvements in the energy efficiency performance of sites to such a degree so that it might not be necessary to deal with the item of energy efficiency in IPPC permitting and inspection. It remained open whether these systems are effective enough to fulfil the requirements of the IPPC directive concerning energy efficiency.

### ***Proposals for further IMPEL work***

During the project the following proposals for further work of IMPEL were identified

- Development of a template for documents and data required regarding energy efficiency in the permit application
- Workshop on assessment of the application documents regarding energy efficiency (for new and existing installations) and development of permit conditions based on BREFs and other sources using a sector specific approach (e.g. food sector, metal processing sector, paper sector, chemical sector, waste treatment plants).
- Training course for dealing with energy efficiency in permitting and inspection.
- Integrating the discussion on energy efficiency into other sector specific IMPEL-projects, e.g. pig farming.
- Explore the overlap between EU ETS and IPPC which may negate the requirement to deal with energy efficiency under IPPC.

#### **Disclaimer:**

This report is the result of a project within the IMPEL Network. The content does not necessarily represent the view of the national administrations or the Commission.

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## ACRONYMS AND ABBREVIATIONS

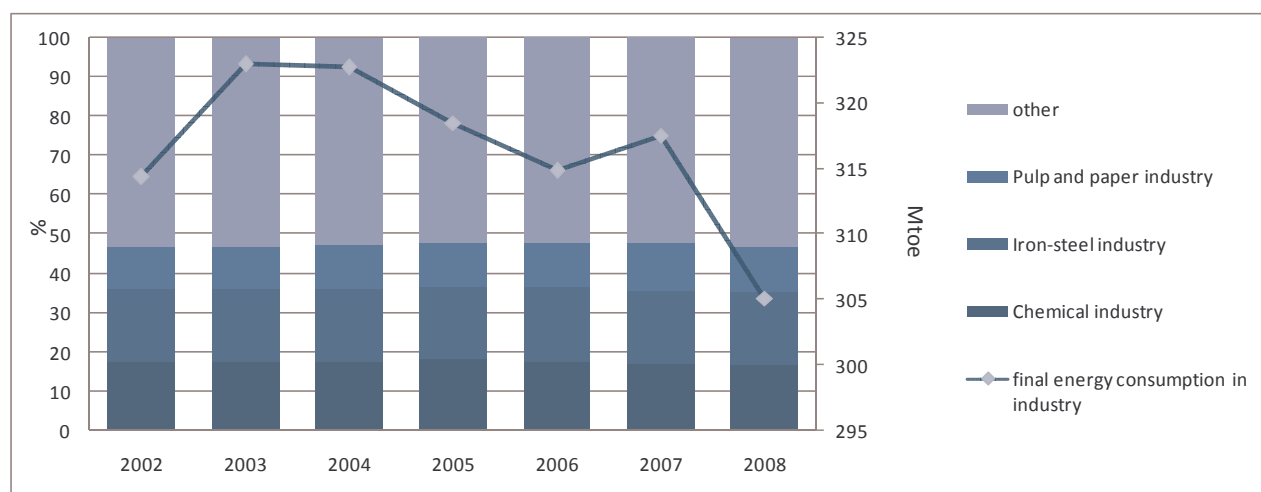
BAT	Best Available Techniques
BATAEL	BAT associated emission levels
BREF	Reference Document on Best Available Techniques
CCA	Climate Change Agreements
CENIA	Czech Environmental Information Agency
CHP	Combined Heat and Power
CRC	Carbon Reduction Commitment
DECC	Department of energy and climate change
EE	Energy Efficiency
EHS	Northern Ireland Environmental and Heritage Service
EIA	Environmental Impact Assessment
EMAS	Eco-management and Audit Scheme
EMS	Environmental Management System
EN 16001	Energy management systems
EPA	Environmental Protection Agency
EPR	Environmental Permitting Regulations
ETS	Emission Trading Scheme
EU	European Union
GHG	Greenhouse gas
GJ	Giga joules
IDAE	Instituto para la Diversificacion y Ahorro de la Energia
IEF	Information Exchange Forum
IPPC	Integrated Pollution Prevention and Control
ISO	International Organization for Standardization
ISO 90001	Quality management standard
ISO 14001	Environmental management system standard
kWe	Kilo watts electrical
kWh	Kilo Watt hour
LCP	Large Combustion Plant
LEE	Long term agreements on energy efficiency for ETS enterprises
LTA-3	Long term agreements on energy efficiency
MEF	Managed Extensibility Framework
MS	Member States
MW	Mega watts
MWe	Mega watts electrical
NEEAP	National Energy Efficiency Action Plan
PDCA	Plan-do-check-act
PEA	Polish Environmental Act
PFE	Programme for Improving Energy Efficiency in Energy Intensive Industries
RTU	Riga Technical University
SEK	Swedish Krona
SHP	Separate heat and power
SME	Small and medium sized enterprises
SYKE	Finnish Environmental Institute
TEHG	The Greenhouse Gas Emission Trading Scheme (German law)
VOC	Volatile Organic Compounds



# 1. INTRODUCTION

Energy policy dedicated to sustainable energy production and security of energy supply as well as climate protection are among the top priorities in the European Union and worldwide. A variety of global, EU and national instruments are aimed to reduce energy consumption and emission of greenhouse gases.

In 2004 industrial energy consumption in the EU-25 was 319 million tonnes of oil equivalent (Mtoe) or about 28% of the annual EU final energy use, and 30% of primary energy demand. In 2008 industrial final energy consumption was 305 Mtoe (see Figure 1). 27% of primary fuels are used in public thermal (electricity) power stations. The next two most energy intensive users are the iron and steel and chemical industries which consume 19% and 18% of industrial energy use respectively. This is followed by glass, pottery and building materials at 13%, and paper and printing at 11%. Around 25% of electricity used by industry is produced by industry itself. The main IPPC emitters account for about 40% of all European CO<sub>2</sub> emissions, about 70% of all SO<sub>x</sub> emissions and about 25% of all NO<sub>x</sub> emissions [Eurostat].



**Figure 1. Final energy consumption in industries EU-25**

The EU has set new targets in the energy and climate package for 2020 aiming at an energy consumption reduction of 20%. This should be reached by implementing energy efficiency improvement measures. Other EU initiatives will support this goal (see chapter 2.1). The Kyoto Climate Change Protocol target for cutting greenhouse gas emissions is 8% below the 1990 levels by 2008–2012. For the Post Kyoto (2012 onwards) period the EU has new targets for the reduction of GHG.

During the discussion on future work of IMPEL at the General Assembly 3-5 June 2009 in Prague the representatives of the Member States mentioned explicitly energy efficiency as a field that IMPEL should work on. Therefore, a follow-up project on energy efficiency was proposed. A first project on this topic was carried out by the Finnish Environment Institute in 2002.

This project uses the same methodology as the first IMPEL project on energy efficiency in environmental permits.

In this project the main objectives were:

- to explore how Member States have implemented in practice the energy efficiency provisions of the IPPC directive and handle obstacles;
- to identify how Member States enforce their legal requirements in this field;
- to find out what kind of information is required in permit applications e.g. energy efficiency indicators;
- to analyse how Member States work with the BREF Energy Efficiency and information of other BREFs related to energy efficiency;
- exchange of information on existing guidance material;
- to find out what is needed most to support Member States in the enforcement;
- to find out which project IMPEL can carry out in the field of energy efficiency and climate change;

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

Another objective was to explore whether alternative instruments such as environmental management systems, voluntary agreements, tax- and ETS-systems produce already improvements in the energy efficiency performance of sites to such a degree that it might not be necessary to deal with the item of energy efficiency in IPPC permitting and inspection

A three-step process was used to get the necessary information. Firstly, a draft questionnaire was drawn up and discussed between project team members. The finalised questionnaire was then sent out to the Member States and Norway after which the replies to the questionnaire were analysed. The project was led by a project team.

The second step was to hold a workshop for gathering more in-depth information by discussing the most problematic questions, identifying key difficulties and good practices for different situations. The workshop was held in Riga from 16–18 June 2010.

The third step was to prepare a final report based on the questionnaire responses and the workshop results. The questionnaire covered main topics of the first IMPEL project on Energy efficiency in environmental permits and was completed by questions concerning concrete examples. [4]. The aim of the questionnaire was to clarify the similarities and differences in the practices of Member States' permit and inspection authorities while dealing with energy efficiency. The focus lay on IPPC installations, but SME were highlighted in some questions too. The following 16 countries replied to this questionnaire: Austria, Denmark, Finland, Latvia, Germany, Norway, Greece, the Netherlands, Poland, Romania, Cyprus, Czech Republic, Bulgaria, Sweden, Spain and the United Kingdom. The compilation of the answers to the questionnaire is presented in Annex I of this report.

The workshop themes were the legal basis for energy efficiency, consideration of energy efficiency in environmental permitting, energy issues in environmental management schemes, monitoring and verification, energy saving agreements and emissions trading. In the seminar, key difficulties in the handling of energy issues in environmental permitting were discussed, 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. Additionally a role game about CHP and a study tour to a dairy plant in Riga were carried out. The seminar agenda and the list of participants are presented in Annex II of this report.

The project team consisted of the project leader - Gisela Holzgraefe, Germany, and four project team members: Susanna Eberhartinger-Tafill, Austria, Judite Dipane, Latvia, Sirpa Salo-Asikainen, Finland and Vilis Avotins, Latvia.

The expertise from the Institute of Energy Systems and Environment of Riga Technical University (RTU) was used as consultancy service. RTU arranged the workshop, participated in presentations of topics and prepared the draft report. RTU involved Prof.Dagnija Blumberga, Prof.Ivars Veidenbergs, Prof. Andra Blumberga, Dr. Marika Rosa and Dr. Claudio Rochas, researchers M.Sc. Liga Ozolina, M.Sc. Arturs Biedris, M.Sc. Alise Berzina and 2 research assistants B.Sc. Kaspars Silins and B.Sc. Dace Zahare.

The project team is grateful to all who participated in this project by answering the questionnaire, by taking part in the workshop and by providing examples of permit conditions etc., improved answers to the questionnaire and the evaluation form as well as comments to the documents produced.

## 2. LEGAL BACKGROUND

### 2.1. *General background*

The IPPC Directive (Integrated Pollution Prevention and Control Directive, 96/61/EC) entered into force on the 30<sup>th</sup> of October 1996. The IPPC Directive has been recently codified (Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control). The codified act includes all the previous amendments to the Directive 96/61/EC text. The substance of Directive 96/61/EC has not been changed.

In about two years the new Directive on Industrial Emissions (IED) will replace current IPPC Directive. The IED will not change the basic obligations of companies to have an environmental permit and apply BAT. However, it will strongly strengthen the application of Best Available Techniques (BAT) by making the BAT Conclusions in the BREFs (BAT Reference Documents) the reference point in the permitting process. This includes commitment to energy efficiency.

Eight years ago IMPEL carried out the project “Energy Efficiency in Environmental Permits”. The Finish Environment Institute presented the final report which was adopted in December 2002 (henceforth Finnish report). This report identified several European Union policy measures affecting and improving energy efficiency.

However since 2002 EU policy regarding energy efficiency has become more severe and strict. Objectives have been set. In 2007 European Commission presented a proposal to reduce greenhouse gas (GHG) emissions by 20% of 1990 level by 2020. The Member States agreed to reach these objectives:

- Reducing energy consumption by 20%;
- Increasing use of renewable energy sources by 20%;
- Increasing the share of biofuel in transport sector by 20%.

In the meantime several important directives that have direct or indirect influence on energy efficiency in different sectors were adopted. These are:

- Council directive 2003/87/EC Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and Amending Council Directive 96/61/EC;

This Directive establishes a scheme for greenhouse gas emission allowance trading within the European Union in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner.

- Council directive 2004/8/EC on the Promotion of Cogeneration Based on a Useful Heat Demand in the Internal Energy Market and amending Directive 92/42/EEC;

The purpose of this Directive is to increase energy efficiency and improve security of supply by creating a framework for promotion and development of high efficiency cogeneration of heat and power based on useful heat demand and primary energy savings in the internal energy market, taking into account the specific national circumstances especially concerning climatic and economic conditions.

- Council directive 2006/32/EC on Energy End-use Efficiency and Energy Services and repealing Council Directive 93/76/EEC;

The objective of this Directive is to enhance the cost-effective improvement of energy end-use efficiency in the Member States by: providing the necessary indicative targets as well as mechanisms, incentives and institutional, financial and legal frameworks to remove existing market barriers and imperfections that impede the efficient end use of energy; and creating the conditions for the development and promotion of a market for energy services and for the delivery of other energy efficiency improvement measures to final consumers.

According to the Directive, Member States had to submit their first National Energy Efficiency Action Plan (NEEAP) to the Commission by June 30, 2007. In their NEEAPs, Member States had to show how they intend to reach the 9% indicative energy savings target by 2016. NEEAPs have to describe the energy efficiency improvement measures that are aimed at achieving the savings targets set out by the Directive. The second NEAP is due June 2011.

- Council directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC;

This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. In order to reach the overall targets laid down in the Directive more easily, each Member State shall promote and encourage energy efficiency and energy saving.

To ensure that the mandatory national overall targets are achieved, Member States should establish their National Renewable Energy Action Plan including national targets for the share of energy from renewable sources consumed in transport, electricity and heating and cooling in 2020. In addition, Member States should set out measures to achieve those targets. Each Member State should assess the contribution which energy efficiency and energy saving measures can make to achieve its national targets. Member States should take into account the optimal combination of energy efficiency technologies with energy from renewable sources. Action Plans had to be notified to the Commission by 30 June 2010.

- Council directive 2009/125/EC Establishing a Framework for the Setting of Ecodesign Requirements for Energy-related Products.

This Directive establishes a framework for the setting of Community ecodesign requirements for energy-related products with the aim of ensuring the free movement of such products within the internal market. The Directive provides for the setting of requirements, which the energy-related products covered by implementing measures must fulfil in order to be placed on the market and/or put into service. It contributes to sustainable development by increasing energy efficiency and the level of protection of the environment, while at the same time increasing the security of the energy supply.

- Council directive 2010/31/EC on Energy Performance of Buildings;

This Directive promotes the improvement of the energy performance of buildings within the Union, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness. The Directive lays down requirements regarding the common general framework for a methodology for calculating the integrated energy performance of buildings and building units, the application of minimum requirements to the energy performance of existing and new buildings and existing and new building units, national plans for increasing the number of nearly zero- energy buildings and other factors.

In February 2009 the Reference document on best available techniques for energy efficiency (henceforth BREF on energy efficiency) was adopted and published. This document contains guidance and conclusions on techniques for energy efficiency that are considered to be compatible with BAT in a generic sense for all installations covered by the IPPC Directive. The BREF on energy efficiency also gives references to other BREFs where particular techniques for energy efficiency have already been discussed in detail and can be applied for other sectors. There are no qualitative requirements defined for energy reduction.

A few years ago the European IPPC Bureau (EIPPCB) started work on the revision of the sector specific BREFs. At the moment drafts of 7 sector-specific BREFs are available online where energy efficiency issues have been explained in more details.

## ***2.2. Implementation of energy efficiency related requirements of the IPPC directive***

Specific reference to energy efficiency issues is given in Article 3 (1d), Article 6 (1b and 1h), and Article 9 (1) and (3) of the IPPC directive. All EU Member States and Norway have transposed these articles into their national legislation either by using direct wording from the text of the directive or rephrasing it. It is also common practice that Member States include additional requirements for installations like e.g. in Romania and Finland regarding submission of additional information regarding use of energy.

According to Article 9 (3) subparagraph 3 the permits for ETS-installations shall – in general - not include emission limit values for CO<sub>2</sub> because this will affect the company's ability to trade on ETS. Subparagraph 4 of Article 9 (3) allows for Member States not to impose requirements relating to energy efficiency in respect of ETS-combustion units or other ETS-units emitting CO<sub>2</sub> on the site. The workshop discussions showed that several member states like Austria, Germany, Sweden and UK do not set emission limit values for CO<sub>2</sub> however do in some cases prescribe energy efficiency measures in improvement programmes or permit conditions. The responses of many countries did not give a clear explanation how these two subparagraphs were transposed into their national legislation.

## ***2.3 Definition of efficient energy use***

The answers to the questionnaire and discussions in the workshop identified different problems that arise from how energy efficiency is defined, and whether it is defined at all. Only in three countries (see below chapter 2.3.1) some definition for energy efficiency is set in the legislation. On EU level only Ecodesign Directive 2005/32/EC defines energy efficiency as a ratio between an output of performance, service, goods or energy, and an input of energy.

The BREF on Energy Efficiency offers no further definition of efficient energy use in the context of the IPPC Directive, however, it gives an overview of available indicators (e.g. the specific energy consumption for a given output/input) and describes how they can be used.

Energy efficiency indicators are needed to evaluate developments of energy efficiency in industry. To develop useful indicators requires a lot of thinking about system boundaries (site, process), values of different types of energy (electricity, heat, fuel), energy production, utility systems and appropriate monitoring points.



In industry, the specific energy consumption for a given output (or input) is the most widely used indicator. Although the definition looks simple, experience in trying to quantify the concept for monitoring processes is challenging. There are several complicating factors, such as:

- energy is not always counted in the same way or using the same parameters
- it is often necessary to look at the energy efficiency of a production process within the energy efficiency of a production site involving several production processes
- the definition does not provide information on whether energy is used or produced efficiently.

To be informative and useful, energy efficiency indicator must be comparable, e.g. to another unit or installation, or over time and for comparison there must be rules. In the case of comparing energy efficiency, it is especially important to define system boundaries to ensure all users are considered equally.

To evaluate energy efficiency and develop suitable indicators it may be helpful to consider the following issues:

- assess the site to find out if a specific energy indicator (SEI) can be established for the whole site
- split the site in production/utility units, if a site SEI cannot be established, or this may be helpful in any cases to identify in detail the energy flows
- define indicators for each production process and for the site or part of it
- quantify specific energy indicators, record how these are defined, and maintain these, noting any changes over time (such as in products , equipment)

Some countries do specify efficient energy use in guidance material (see below chapter 2.3.2). Discussions in the workshop showed that it is hard to agree on an energy efficiency definition as in some cases this depends on the system boundaries. One example is for instance, waste incineration installations in rather remote areas where there is no use for the heat. The overall energy efficiency is rather low in this case whereas in populated areas it could be improved by the use of CHP. However, if the BAT requirements for the installation are met it is considered energy efficient.

One tool for checking of energy efficiency is benchmarking. The most obvious benchmarks are specific data for energy consumption of production processes in the BREFs. In the in absence of BAT data in the BREFs benchmarks could be consumption data from other similar installations, standards in legislation or other reference documents. They can be set annually for the same installation or between installations inside the sector. For instance, the cement industry makes different types of clinker trough different processes and benchmarks for each process of the cement industry might be set accordingly. However, benchmarks are still under development and are not used widely. Due to the lack of data some enforcement agencies/authorities (e.g. in UK) started to collect and evaluate available data for this purpose.

### **2.3.1 Specific definition of efficient use of energy in countries legislation**

In most of the countries (Austria, Bulgaria, Cyprus, Denmark, Finland, Germany, Latvia, Norway, Spain, Sweden and UK) there is no reference to or a specific definition of efficient use of energy in their national legislation. However in Germany principles like heat recovery and conservation are defined.

Only 2 countries (the Netherlands and Romania) identified that there is a definition on efficient use of energy in their legislation. In the Netherlands according to the multi-annual negotiated agreements participating companies with an electricity use > 200.000 kWh or a gas consumption > 75.000 Nm<sup>3</sup> are required to implement all known energy efficiency measures with return of investments of maximum 5 years. A register of these measures is available (Besluit algemene regels voor inrichtingen milieubeheer).

The Romanian normative act (Governmental Ordinance no. 22/ 2008) defines “Energetic efficiency – the ratio between the value of the performing result obtained – consisting in services, goods or the resulted energy – and the value of the energy utilized for this purpose” and “The improvement of the energetic efficiency – the increase of the energetic efficiency at the final consumers, as a result of the technological, economical and/ or attitudinal changes”.

### 2.3.2 Guidance on efficient use of energy

A European-wide guidance in the context of IPPC is available through the BREF on Energy Efficiency. Apart from that resource most countries provide guidance on efficient use of energy. Most of that guidance, however, is not provided especially for use of the environmental authorities but in general to save energy and money.

The **United Kingdom** provides guidance on efficient use of energy in Horizontal Guidance Note, IPPC H2, Integrated Pollution Prevention and Control (IPPC), Energy Efficiency and in sector specific guidance notes. The horizontal guidance provides cross-cutting information relevant to all IPPC sectors and supplements the IPPC sector guidance notes. (available online <http://www.environment-agency.gov.uk/business/topics/permitting/32320.aspx>). Operators are required to

- take appropriate measures to ensure that energy is used efficiently in the activities;
- review and record at least every four years whether there are suitable opportunities to improve the energy efficiency of the activities; and
- take any further appropriate measures identified by a review.

The operators must also report their energy usage on an annual basis. The authorities examine via sector benchmarks whether installations have to improve their performance relating to energy efficiency.

In some guidance documents for operators UK provides benchmarks for several sectors in the chapters on energy efficiency. Examples:

a) Dairy and milk processing sector (EPR 6.13):

You should where appropriate:

achieve the benchmark values set out in the table below:

	Energy consumption
Milk	0.07 – 0.2 (kWh/l)
Powdered milk	0.3 – 0.4 (kWh/l)
Ice cream production	0.6 – 2.8 (kWh/l)

b) Red meat processing (EPR 6.12)

You should where appropriate:

meet the energy benchmarks shown in the table below:



	Heat and electricity (kWh/animal)
90 kg pigs	30 – 125
250 kg cattle	70 - 300

**Denmark** provides sector energy analysis and some horizontal guidelines (e.g. on ventilation, heating, compressors and electric light) from the Danish Energy Agency.

**Finland** has published a report on how to use the Energy efficiency BREF in practice.

In **Austria** currently a guidance on the climate and energy concept within the Environmental Impact Statement (Environmental Impact Assessment - EIA procedure) is being elaborated (finalisation envisaged for October 2010). This guidance will provide information for developers and authorities on the necessary energy related data and on the state of the art referring to energy efficiency for certain sectors (IPPC installations but also other project types like e.g., urban development projects). Concerning the state of the art the guidance will make use of the available data in the BREFs. Within the Austrian klima:aktiv campaign various guidance material has been issued (on topics such as ventilations systems, pumps, motor-driven systems). The focus of these brochures is on SMEs. The Austrian Chamber of commerce also offers guidance on energy efficiency (e.g. energy efficiency checklist for companies). The Austrian Federal Environment Agency has published some studies on energy efficient technologies in certain industrial sectors.

**Bulgaria** and **Latvia** provide guidance on defining efficient use of energy as a part of BAT, guidance on the scope of the IPPC application.

**Table 2.3: Guidance on efficient use of energy (general and sector specific)**

Kind of Guidance	AT	CY	DE	DK	FI	NO	RO	UK
General				X	X		X	
General for industry & crafts	X	X	X	X	X		X	X
General on Energy Management Systems	X		X	X	X	X		
Compressed air	X		X	X	X	X		
Cooling systems	X	X	X	X	X			
Heating systems	X	X		X	X			
Electric motor-driven systems	X			X	X	X		
Pumping systems	X			X	X	X		
Lighting systems	X	X	X	X		X		
Office buildings		X	X	X	X	X	X	
Hotels and Restaurants	X			X	X	X	X	
<b>Sector specific</b>								

Agriculture –intensive farming			X	X	X			X
Bakeries			X	X		X		
Butcheries			X	X		X		
Chemical industry								X
Combustion activities					X			X
Dairy and milk processing						X		X
Engineering works			X					
Food and drink sector			X			X		X
Galvanic industry			X					
Glass industry			X					
Meat processing industry			X			X		X
Paint shop			X					
Paper industry			X					
Plastics processing			X					
Porcelain industry			X					
Production of Coke, Iron and steel								X
Refining installations								X
Textile industry				X				X

In **Germany** the Federal Ministry for the Environment has not issued national guidance, only a brochure with advice on energy efficiency in industry and crafts. Environmental Ministries of the federal states or their agencies have published guidelines on efficient energy use. They can be found on the individual homepages, e.g. Bavarian State Agency for the Environment: has 10 general guidance papers (energy efficient use of compressed air, lighting systems, etc.), 15 branch specific guidance documents with examples (paper industry, paint shop, porcelain industry, plastics processing, glass industry ...) and commerce, crafts and services (butcheries, bakeries ..). The website of the German Energy Agency (dena) provides an overview. On top of that industrial associations and chambers of commerce offer some sort of guidance to their members.

Guidelines of VDI – Verein Deutscher Ingenieure (Association of German Engineers) e.g. VDI 4602 "Energy Management", VDI 3807 "Characteristic values of energy and water consumption in buildings", VDI 3922 "Energy consulting for industry and business", VDI 4661 "Energetic characteristics – definitions – terms - methodology" etc. are a source of information from a non-governmental organisation. The VDI-guidelines are often taken into account for the determination of BAT.

**Romania** provides guidance in Annex 1 to the Governmental Ordinance no. 22/2008 regarding energy efficiency and the promotion of the utilization of the renewable energy resources by the final consumers. "The Indicative List with Examples of Eligible Measures for the Improvement of Energy Efficiency" includes measures for the main sectors (industry, residential and tertiary sector, transports) as well as trans-sectoral and horizontal measures.

**Cyprus** does not provide any official guidance on efficient use of energy but wide information on related issues (utilisation of renewable sources of energy, measures undertaken for energy efficiency, innovated energy efficient technologies) has been published and is available on the website of the Ministry of Industry, Commerce and Tourism (Energy Services). Further guidance is provided by the competent authorities for issuing permits during the permit procedure.

**Norway** applies an agreement between the energy authorities and the federation of Norwegian Industries (NI) concerning the improvement of the energy efficiency performance in industry. The energy authorities have guidance available on efficient use of energy, e.g. on general energy management systems, compressed air, pumping and electric motor driven systems, lighting systems covering industry, occupational buildings and residential buildings.

This overview shows that in many countries a variety of guidance on efficient use of energy (general and sector specific) is available at different places. The dissemination and promotion have to be improved. The target groups need information about the existence and training on the application.

### 3. THE AUTHORITIES AND ORGANISATIONS

#### 3.1. The Competent authorities and organisations

*The IPPC directive states: “competent authority” means the authority or authorities or bodies responsible under the legal provisions of the Member States for carrying out the obligations arising from this Directive.*

This chapter deals with the identification of different competent authorities issuing permits, monitoring compliance and enforcing energy use and efficiency as well as giving guidance on energy efficiency issues. As the analysis of the questionnaire shows the main authorities involved in issuing permits and evaluating monitoring are environmental institutions. In spite of the fact that energy efficiency in permitting procedures has been introduced 14 years ago cooperation with authorities working on energy and energy efficiency issues and knowledge capacity of the environmental bodies is still under development.

#### 3.1.1. Competent bodies for giving guidance on energy efficiency in environmental permits

There are different organisations giving guidance on energy efficiency in environmental permits. The most common approach in the EU (in 9 countries) is to get this assistance from environmental organisations like ministries of environment (Austria, Bulgaria, Czech Republic, Cyprus, Finland, Greece, Latvia), ministries of economy (Poland) or environmental agencies (Norway, Sweden, United Kingdom). However, there are countries where the main competence regarding energy efficiency lays on the level of energy agencies (Denmark, Spain, partly Finland and Austria). In Romania guidance on energy efficiency issues can be received from energy and environmental authorities. In Czech Republic additional guidance can be obtained from regional authorities. In Germany the organisations of the federal states can give guidance as far as the federal Ministry of Environment has not yet issued it. In some of the German federal states environmental agencies have issued guidance on energy efficiency.

**Table 3.1. Institutional competence for guidance on energy efficiency issues**

Country	Ministry of environment or equivalent	Ministry of economy or equivalent	Energy agency	Environmental agency	Other institution
Austria	√	√	√	√	
Bulgaria	√				
Czech Republic	√				√
Cyprus	√				√*
Denmark			√		
Finland	√		√	√	√
Germany	√			√	√
Greece	√				
Latvia	√				
The Netherlands					
Norway				√	

<b>Poland</b>		√			
<b>Romania</b>			√	√	
<b>Spain</b>			√		
<b>Sweden</b>			√	√	
<b>United Kingdom</b>				√	

\* Ministry of Labour and Social Insurance (competent for issuing the Air Emission Permit)

### 3.1.2. Competent authorities for issuing permits including energy efficiency

The Analysis of the questionnaire has identified considerable differences between countries regarding competent authorities for issuing the IPPC permits.

Authorities for issuing of IPPC permits (including EE issues) in the selected countries can be divided into 5 large groups:

- Ministry level;
- Agency level;
- Regional level;
- Municipality level;
- Other institutions – the Environmental courts and the Environmental licensing delegations at the County administrative boards in Sweden.

In some cases (Austria, the Netherlands, Poland, Czech Republic, Germany, Greece) regional or municipal bodies are named, however it is not clear what kind of organisation issues the permits (if it is environmental authority or other).

**Table 3.2. Competent authorities for issuing permits**

<b>Country</b>	<b>Ministry of environment or equivalent</b>	<b>Environmental agency or equivalent</b>	<b>Regional / district level</b>	<b>Municipal level</b>	<b>Other</b>
<b>Austria</b>			√		
<b>Bulgaria</b>	√				
<b>Czech Republic</b>	√		√		
<b>Cyprus</b>	√*				√
<b>Denmark</b>	√			√	
<b>Finland</b>			√	√	
<b>Germany</b>			√		
<b>Greece</b>	√		√	√	
<b>Latvia</b>		√			
<b>Netherlands</b>			√	√	
<b>Norway</b>		√	√		
<b>Poland</b>			√		
<b>Romania</b>		√			
<b>Spain</b>			√		
<b>Sweden</b>					√**

<b>United Kingdom</b>		√		√	
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\* Ministry of Labour and Social Insurance (competent for issuing the Air Emission Permit)

\*\* Environmental Courts and Environmental licensing delegations at County administrative board

### 3.1.3. Competent authorities for monitoring compliance with energy efficiency conditions

In 11 countries (Austria, Czech Republic, Cyprus, Germany, Denmark, Latvia, Norway, Poland, Spain, UK) the same authority that has issued the permit is also responsible for compliance monitoring. In Denmark the monitoring is undertaken by the Danish Energy Agency (in case of a voluntary energy saving agreement between operator and agency) otherwise the same authority issuing permits guarantees monitoring compliance. In Finland regional Centres for Economic Development, Transport and the Environment and municipal environmental authorities are responsible for the compliance monitoring.

In the meantime in Czech Republic, Bulgaria and Greece inspectorates have been given the responsibility for monitoring the compliance. In the Netherlands the Agency is responsible for the implementation of monitoring for long-term agreements on energy efficiency and long-term agreements on energy efficiency for ETS enterprises. In Romania the responsibility is split between Regional Agencies for Environmental Protection in cooperation with local structures of the National Environmental Guard and the Romanian Agency for Energy Preservation (ARCE). In Sweden regional or local authorities are responsible for monitoring.

**Table 3.3. Responsible authorities for monitoring compliance with EE conditions**

Country	Same authority that issues permit	Inspectorates	Other
<b>Austria</b>	√		
<b>Bulgaria</b>		√	
<b>Czech Republic</b>	√	√	
<b>Cyprus</b>	√		
<b>Denmark</b>	√		√
<b>Finland</b>	√	v	
<b>Germany</b>	√		
<b>Greece</b>		√	
<b>Latvia</b>	√		
<b>Netherlands</b>			√
<b>Norway</b>	√		
<b>Poland</b>	√		
<b>Romania</b>			√
<b>Spain</b>	√		
<b>Sweden</b>			√
<b>United Kingdom</b>	√		

### **3.1.4. Competent body for enforcement of energy use and efficiency**

In 9 participating countries (Austria, Czech Republic, Denmark, Germany, Greece, Norway, Poland, Spain, UK) the enforcement of energy use and efficiency is undertaken by the same competent authorities that issue the permits. In Bulgaria, Romania and Sweden the same authority that monitors compliance with energy efficiency conditions (e.g. inspectorates etc.) ensures the enforcement of energy use and efficiency. In Finland enforcement is carried out by Centres for Economic Development, Transport and the Environment and municipal environmental authorities. In Latvia the competent authorities are the Ministry of Environment, Ministry of Economics and State Environmental Service and in Cyprus the Ministry of Commerce, Industry and Tourism.-Energy Service.

### **3.2. *Co-operation between authorities/organisations***

In the last decade energy issues like energy efficiency and sustainable energy use have become one of the top priorities at the European Union level, Member States' and regional level and therefore more and more organisations in the countries are involved.

Answers to the questionnaire and discussions in the workshop showed that organisations issuing permits are often not sufficiently competent in energy issues. Due to the potentially large number of involved parties, it is quite common that the cooperation between all these organisations is weak and should be improved. Some countries (Austria, Sweden, and Romania) highlighted the lack of expertise concerning energy efficiency in the authorities competent for IPPC permitting and inspection and proposed specific training to improve their knowledge.

## 4. ENERGY EFFICIENCY IN THE PERMIT PROCEDURE

### 4.1. National guidance provided to the applicant in order to evaluate energy efficiency of the operation

Almost all the countries (except 4 countries) have a national guidance available for applicants how to evaluate energy efficiency of the operation. This guidance in some cases has been developed in the framework of some other scheme established in the countries (the Netherlands, Norway). However in most of these countries (Austria, Denmark, Cyprus, Finland, Norway, Spain, Sweden, Poland and United Kingdom) the official status of the guidance is non-binding. Results of analysis of questionnaires are presented in Table 4.1.

**Table 4.1. National guidance provided to the applicant**

Country	Yes	No	Notes	Non-Binding guidelines
<b>Austria</b>	√		Draft guidance under development for Environmental Impact Assessment procedures	√
<b>Bulgaria</b>	√			
<b>Czech Republic</b>	√		General national guidance for application of integrated permit	
<b>Denmark</b>	√		Guidance intended to be used in connection with an agreement with the Energy Agency	√
<b>Finland</b>	√		Best Available Techniques (BAT) - Energy efficiency in permitting and inspection, several sector specific energy efficiency guidelines	√
<b>Greece</b>	√		Ministerial Decree applied on textile sector	
<b>The Netherlands</b>	√		Energy Covenant contains list of measures	
<b>Norway</b>	√		NS-EN16001 Standard on energy management systems and general guidance on energy management systems from the energy authorities	√
<b>Romania</b>		√		
<b>Sweden</b>	√			√
<b>The United Kingdom</b>	√		Horizontal and sector specific guidance of the Environment Agency	√
<b>Poland</b>		√		
<b>Cyprus</b>		√		√
<b>Germany</b>	√		DIN EN 16001: Energy Management Systems in Practice – A Guide for Companies and Organisations	√
<b>Latvia</b>		√		
<b>Spain</b>	√			√



## **4.2. Practical aspects of permitting – preliminary contacts**

The applicant shall present what is possible to do and his/her view on whether or not the different measures are BAT for the sector and whether or not such a measure is reasonable to take at the installation. In this assessment capital, running and maintenance costs as well as benefits such as reduced energy costs and reduced emissions might be an issue.

During the preliminary contacts between applicant and authority advice on the project will be given and the authority will also communicate early whether it sees any definite compliance problems. In practice, if any difficulties are encountered, improvements of the project can occur during the permitting procedure.

In Germany if the authority has knowledge about a very energy efficient technology that is BAT for an existing installation and the operator can prove that the realisation lacks proportionality the authority shall refrain from such subsequent orders or obligations in a permit.

In Romania negotiations between applicant and the competent authority are in place when the negotiated items are subject of so-called “Action Plans”, which include compliance measures to be taken during the “transition period” for the installations concerned. The subjects of negotiation can be: the concrete content of the measures to be taken in order to comply with IPPC requirements and the dead-lines for the measures approved for the respective installation.

In United Kingdom for existing installations, an improvement programme with prescribed dates for completion is set up. The negotiations are site specific and have take into account its circumstances.

In Sweden all energy efficiency measures shall be taken as long as they are not unreasonable. The burden of proof whether a measure is unreasonable lies on the operator.

## **4.3 Application documents**

### **4.3.1 Required information concerning energy use**

Information required concerning energy use can be divided in two groups: general and specific information (see Table 4.2.). In this case “general” is meant information asked according to the IPPC directive (Article 6 (1b): Description of the raw and auxiliary materials, other substances and the energy used in or generated by the installation.

As indicated by the respondents of the questionnaires general description includes information regarding energy sources, energy consumption, energy flows, capacity of installation, power/energy generated by the activity, recovered energy, planned improvements etc. Only Finland already in 2002 [4] indicated the existence of a special application form for energy efficiency (see Box 1).

**Table 4.2. Information concerning energy use in the application**

<b>Country</b>	<b>General</b>	<b>Specific</b>	<b>Notes regarding specific information</b>
<b>Austria</b>	√	√	Description of the climate-relevant greenhouse gases arising from the project and measures to reduce them with a view to climate protection; For EIA-projects certificate of an authorised consulting engineer or technical consulting office stating that the

			measures included in the climate and energy concept comply with the state of the art (state of technology - BAT).
<b>Bulgaria</b>	√		
<b>Czech Republic</b>	√	√	The operator is required to include energy efficiency in application for new installations of power stations and waste incineration plants.
<b>Denmark</b>	√		Combustion/incineration plants: operators must include a description on how energy outputs fit in the energy system, for instance district heating, in order to see that energy losses will be minimised
<b>Finland</b>	√	√	A specific application form for energy efficiency should be filled in by the operators. Waste incineration operators must include also specific information - information on how heat generated in combustion is utilised.
<b>Germany</b>	√	√	The documents must contain information about planned measures for economical and efficient energy use, especially information about possibilities for achieving high energy efficiency and high rate of utilisation, for minimisation of energy loss and use of generated energy. LCPs: information about possible CHP-measures Waste incinerators: information how the heat generated by the incineration or co-incineration process shall be used. This includes e.g. information about substances used, heating value and produced quantity of steam.
<b>Greece</b>	√		
<b>The Netherlands</b>	√		
<b>Norway</b>	√		
<b>Romania</b>	√	√	Lot of specific information included for applicant: particular data of energy activities, types of installations, operational and maintenance, etc. A plan for energy efficiency has to be set up.
<b>Sweden</b>	√		The application should include: - energy “production” and consumption - technologies used and their consumption - possible additional measures incl. BAT - cost-benefit analyses for these measures - whether or not the measures are regarded as - unreasonable and in that case why - any proposals for measures/conditions
<b>United Kingdom</b>	√	√	Beside description of the basic measures for improving energy - efficient activities, applicant has to provide a breakdown of any changes to the energy activities use and create and to describe the specific measures which are used for improving energy efficiency.
<b>Poland</b>	√		Annual energy use in total and per product.
<b>Cyprus</b>	√	√	Beside general information application includes description on how to obtain energy efficiency

			(technologies/ equipment).
<b>Latvia</b>	√		

### **Box 1. Finnish application for energy efficiency**

Operators in Finland as annex to the application for IPPC permit submit an assessment of the energy efficiency. Application form includes following questions:

1. Energy saving agreement and environmental management system.
2. Total energy balance, MWh (electricity, heat, fuel).
3. Energy generation per boiler, MWh (use (fuel, electricity), output (electricity, heat: steam, hot water, other heat)).
4. Energy consumption in process parts (electricity; heat: steam, hot water, other heat; fuel; process part output (t/year or other)).
5. Energy efficiency estimate is based on the following documentation (replies to the questions for companies which have / have not made an energy analysis or an energy review according to the MOTIVA model and with the support of the Ministry of Employment and Economy).
6. Steps taken during the last three years to improve energy efficiency.
7. Planned steps to improve energy savings.
8. Planned environmental protection investments.
9. Company's or company representative's assessment of energy efficiency.

### **4.3.2 Required information concerning monitoring**

The IPPC directive does not provide clear indication for monitoring and does not set monitoring requirements on energy efficiency. As one of the obligations of the operators is “to use energy efficiently” they must do the monitoring to prove the efficient use of energy.

At the moment in Member States permit conditions related to energy efficiency monitoring are mainly missing in most countries. However, experience and results about specific energy efficiency monitoring are available in several EU and national schemes. Provisions including mandatory monitoring are defined e.g. in EU ETS, Waste Incineration Directive 2000/76/EC and E-PRTR according to IPPC.

Monitoring results of these schemes can be used for IPPC installations. However monitoring systems could be improved in this respect. In several countries operators of IPPC installations have to submit data on electricity and fuel consumption annually with their environmental reports (CY, CZ, ES, UK, RO, DK, NO, SE).

In most countries information from EMAS, ISO 9001, 14001, 16001 and / or other voluntary management systems may be utilised in the permitting procedure. More information on established voluntary management systems in different countries is given in Chapter 6.

## **4.4 Permit Consideration**

### **4.4.1 Permit Consideration – Energy Efficiency**

Energy efficiency is part of a BAT consideration. In addition to that it is stated in Article 3 of the IPPC Directive that Member States shall take the necessary measures to ensure that an application to the competent authority for a permit beside other things includes information on energy efficiency.

Some countries indicated that they look only at the most energy consuming parts of the installation. Almost all countries consider specific energy systems like combustion, steam, heat recovery, cogeneration, electrical power supplies, electric motor driven subsystems, pumping systems, heating, air conditioning and ventilation, lighting, drying and separation.

It is however not clear from the responses to the questionnaire what the level of checking of information regarding auxiliary systems like heating, pumping, lighting etc. in the companies is.

**Box 2. The use energy efficiency agreements in permitting and inspections in Finland**

For the moment the agreements are not fully utilized in the environmental permitting and in the inspection procedures. However, the system has a great potential. Companies which have joined in the agreement know well already now or at least in some years their energy system (production, process use, utilities etc.). This is a good basis to improve energy efficiency. Information from the agreements is already now used in permit applications and energy efficiency analyses are encouraged during permit processes and inspections. For permit authority it is important to know energy efficiency as such and as an element in the BAT-assessment. To assess continuous improvement also indicators are needed. Annual reports contain a lot of important information about development of the energy efficiency and should be available for authorities as well. Furthermore, permit and inspection authorities should have a bigger role in the development of indicators. As a conclusion for the permit and inspection authorities' work it is useful that companies have joined into energy efficiency agreements but it is not enough as such. Companies have to inform authorities in detail about energy efficiency issues to verify that all requirements of the IPPC-directive, future IE-directive are met.

- Denmark has mentioned that IPPC installations usually make agreements with the Danish Energy Agency concerning EE.

#### **4.4.2 Permit Consideration - Cogeneration**

According to CHP Directive 2004/8/EC and LCP Directive 2001/80/EC Member States shall ensure that the technical and economic feasibility of providing for the combined generation of heat and power is examined. Where the feasibility is confirmed, bearing in mind the market and the distribution situation, installations shall be developed accordingly. This means that possibilities for cogeneration shall be studied in every permit consideration. However the implementation of this requirement has been vague in many Member States.

The answers to the questionnaires and discussions during the workshop indicated that adequate land use planning is an essential precondition regarding construction of cogeneration plants. In UK the Planning Authority determines location and infrastructure. They are working to ensure the location that allows viable CHP. It is a requirement in the permitting process to consider CHP and if the operator is not proposing CHP they have to provide a justification why they are not using CHP.

In some countries like Latvia installation of CHP is a political decision and permitting authorities are not competent to discuss the issue. Most of the countries exercise the discretionary judgement in the permitting procedure and use the restrictions that are defined in the national legislation. (technical and economical feasibility). Problems arise when the permitting authority can not be sure if all possibilities to find heat utiliser(s) have been explored.

In Finland CHP is common practice. UK currently reviews the requirements concerning this issue.

In general in all countries the decrease of energy efficiency at the installation (e.g. by losing an important heat user) or if substantial changes of the state of the art relating to energy efficiency occur would result in the revision of the existing permit. However participants of the workshop could not report a concrete case where only changes in energy efficiency resulted in the revision of the permit. Typically other issues, for example changes in emissions, would lead to the reconsideration of the permit. The countries have different timelines for formal permit review, Latvia 7 years, UK 4 years.

In Finland the evaluation of energy efficiency is made on a case by case basis. An example for the general practice is a biomass (bark) dryer utilising waste heat, which was built on the same site with a paper machine and a power plant utilising the dried biomass. The dryer had a major effect on the energy efficiency of the power plant, but no change on actual emissions to air and water, so the permit for the power plant was not reconsidered (power plant and paper mill).

The individual legal background in the countries sometimes makes it difficult to consider energy efficiency in the procedure. It remained unclear whether in case of alterations of installations the overall efficiency will be assessed or only the efficiency of the changed part.

## **4.5 Permit conditions**

### **4.5.1 Energy efficiency in the permit**

Most countries rely on permit conditions. UK has an additional system.

In the **UK**, all installations under the scope of IPPC shall meet a set of basic energy requirements for energy efficiency. These include:

provision of information on energy consumed or generated by the activities within the permit and the associated direct and indirect carbon dioxide emissions

- energy management provisions
- a description of the 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.

All installations under the scope of IPPC 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 Carbon Reduction Commitment
- or
- through compliance with further permit-specific requirements as determined with the regulator.

In **Romania** permits include a separate sub-chapter: “Efficient use of energy”, with a more detailed evaluation. All operating IPPC installations periodically have to perform an energy audit and to report the results to the competent authorities. In case of non-compliance of existing installations the requirements for energy efficiency are incorporated into the permit as “Action Plan” with measures to be taken in order to comply with the legal demands. Besides this, in the chapters “Monitoring” and “Reporting” of the IPPC permit, specific requirements are formulated

including monitoring and reporting of the emissions from combustion processes; the reporting of specific energy consumptions etc. A general requirement for permit owners is to present to the competent authorities the Annual Environmental Report, which includes the section "Efficient use of energy".

In **Cyprus** each permit includes specific requirements regarding measures that must be taken by the facility operator for efficient use of energy. Most commonly, measures refer to the following:

- monitoring and maintenance of equipment on regular basis;
- prevention of energy losses (i.e. by using insulating materials, alarm systems, etc);
- application of systems and techniques (i.e. for lighting, air conditioning, pumping, etc) of lower energy consumption;
- detailed record keeping.

In **Austria** the requirements concerning energy efficiency are incorporated in the permit as a binding specific permit condition or by declaring the project description as integrated part of permit. Both of these options have been used.

Example: Extension of an integrated work for the initial melting of cast-iron and steel in Linz (integrated EIA procedure): increase of production capacity to 6 million tonnes steel/year. For an EIA project the operator had to submit to the authority an application for development consent that contains the documentation required under administrative law for the approval of the project and the Environmental Impact Statement. The competent authority demanded comprehensive application documents relating to energy demand and efficiency and an „energy and waste-heat study” of the site which evaluated the potentials for energy-saving and use of waste-heat.

The following conditions were included in the integrated EIA permit:

- to keep informed on technical developments in the iron and steel sector referring to energy efficiency
- to carry out an energy monitoring (yearly basis, choice of fuel, use of specific benchmarks) for the important installations (sinter plant, blast furnace, hot rolling mill, power plant)
- new assessment of the energy saving potentials on the basis of the energy monitoring (5 years after issuing the permit)
- Insulation of the steam pipes

In **Finland** the requirement for energy efficiency is an integrated part of the permit consideration. This leads usually to specific permit conditions. Examples from Finnish permits are:

1. Reporting permit condition-"Realised measures that have improved the energy efficiency must be reported annually in the annual report according to permit condition 64." (Oil refinery) and more specific permit condition- "The plant should aim to operate as energy efficiently as possible. The Operator must submit a written statement by 28.2.2008 about measures, which help to improve the energy efficiency of the plant. On evaluation energy efficiency, the possibilities for utilizing the waste heat from VOC afterburner and capacity and annual water consumption of the cooling system on the factory need to be taken into account (Packaging factory).
2. Coal fired power plant - no specific permit conditions were given, but under motivation for issuing the permit it is mentioned that: "Based on the information presented in the application, it was evaluated that the activity is operating on energy efficient manner".
3. Brick factory - no general motivation for energy efficiency was given for permit consideration, but operator got a permit condition stating that: "Energy efficiency of the



brick works must be controlled continuously and it must be documented. The permit condition was motivated by: "Permit condition on energy efficiency is based on environmental protection degree § 43, which states that when assigning permit conditions one must take into account the efficient use of energy."

4. Steel mill - no general motivation for energy efficiency was given for permit consideration, but operator got a permit condition stating that: "The company must submit an action plan to competent authority based on the energy audit, covering energy efficiency measures taken and planned, as a part of the application for reconsidering the permit." The permit condition was motivated by: "By operation on energy efficient manner it is possible to reduce the consumption of non-renewable fuels and environmental impacts of fuel production. Energy analysis conducted according to the energy saving scheme has been assigned to be attached to the permit application for reconsidering the permit, so that it can be evaluated, whether further permit conditions are necessary for executing the energy savings possibilities of the energy analysis".

Examples from **Sweden** include requirements on

- use of energy per produced unit
- design of equipment to reach certain energy consumption per produced unit.

#### **4.5.2 Differences in energy efficiency requirements between sectors**

The answers to the questionnaire were that generally there are no legal differences in energy efficiency requirements between sectors in Austria, Cyprus, Denmark, Finland, Germany, Latvia, Netherlands, Spain, Sweden, Poland and United Kingdom. However, in practice there are of course differences due to the fact that different sectors have different process equipment and different possibilities to take measures. Measures in different sectors may be different. The Netherlands has mentioned that in practice differences can arise from the existence of non active policy of trade associations to establish industry specific measures. In Sweden requirements are set individually. In Cyprus depending on the industrial sector, a provision is proposed which obliges the operator to use specific equipment – i.e. permits for the installations for the manufacture of ceramic products include a condition that requires the use of Tunnel Ovens.

### **4.6 Best available techniques**

#### **4.6.1 Development of BREFs concerning energy efficiency aspects**

The integrated pollution prevention and control reference document on best available techniques for energy efficiency (ENE BREF) [3] was published in February 2009.

This document was specifically mandated by a special request from the Commission Communication on the implementation of the European Climate Change Programme (COM(2001)580 final) ECCP concerning energy efficiency in industrial installations. The need for the development of this document was a central item in the Finish report.

In September 2009 the European Commission published a Summary on Energy Efficiency issues in the BREF Series. The aim of this study was to summarise and gather the available information on energy efficiency for the industrial sectors covered by the IPPC Directive in systematic and structured way.

At the moment the revision of sector specific BREFs is being carried out with i.a. the objective to address more in detail the energy efficiency issue.

## **4.6.2 Use of EU BREFs in the permit procedures**

### **4.6.2.1 The experiences with the use of the EU BREFs in the permitting process**

Many countries have indicated that the common practice in general is to use BREFs in the permitting procedure (Austria, Czech Republic, Denmark, Finland, Romania, Greece, Cyprus, Sweden, Norway and UK) however some of the countries apply national “obligations”. In Germany generally relevant limit values and other requirements are laid down in ordinances, technical instructions and other technical guidance papers or guidelines. They are based on the best available technique and shall protect against any harmful effects on the environment and prevent the emergence of any such effects. Information of BREF documents are taken into account. Permit writers can refer to the BREF documents, but it is not allowed that the requirements in the permit fall behind German law.

Some countries produce tailor made national reference documents for their purposes. Such approach is used in United Kingdom where sector guidance notes were developed which include sections on energy efficiency. At the moment all of these documents are under revision. One of the options considered by UK is to reflect the BREFs into a specific format against which their field staff will carry out specific energy efficiency audits. Also in Finland national sector specific guidance documents have been produced as well as tailor made national ENE BREF. In Czech Republic a specialist group has been established to support regional authorities in evaluation of BAT.

### **4.6.2.2 The horizontal BREF on energy efficiency techniques**

The horizontal BREF on energy efficiency techniques has been developed recently (February 2009). This could be one reason why the use of the document has not yet been explored intensively in the MS. The main comment of the countries during the survey concerned the complexity of the horizontal BREF. One solution could be to incorporate the energy efficiency issues into the sector specific BREFs. Another approach is used in Finland and United Kingdom where horizontal BREF has been harmonised with national sector specific guidance.

### **4.6.2.3 The relevant data in BREFs used as benchmarks for energy efficiency**

Many countries (Austria, Bulgaria, Czech Republic, Denmark, UK, Norway, Poland, Greece, Finland, Cyprus, Romania, Sweden) use any available and relevant data in BREFs as benchmarks for energy efficiency. Benchmarks have been mentioned and used in the permits, when these exist in BREFs and are relevant for certain activity. In Finland this approach is used for instance for the LCP sector, in Austria for the cement, iron and steel sector and in Romania in the cement production sector and in the sector of chemical installations producing basic inorganic chemicals such as ammonia.

For establishing a benchmark system United Kingdom is reviewing the BREF benchmarks now as well as other benchmarks such as EU ETS benchmarks. UK has also guidelines on GHG



Conversion factors for carbon reporting published by the Government (based on fuel usage, activity data, conversion factors).

In the Netherlands, Latvia, Spain and Sweden the BREF data is not used as benchmarks for energy efficiency.

### 4.6.3 Other sources for evaluation of BAT for energy efficiency

#### 4.6.3.1 Other sources used for evaluation of BAT for energy efficiency

Many countries use also other sources to evaluate energy efficiency that are summarised in Table 4.3.

**Table 4.3. Other sources to determine energy efficiency**

Country	Yes	No	Source
Austria	√		energy consumption data from comparable operators in the sector
Bulgaria	√		Technical specifications of the equipment
Cyprus	√		Technical specifications of the equipment
Czech Republic	√		National official sources: 1) Catalogue of measures to reduce energy efficiency, 2) Energy intensity of production of selected products
Denmark	√		Using webpages
Finland	√		Unofficial benchmarking with other installations on same sector
Germany	√		Environmental Ministries or agencies of the federal states or their agencies have published guidelines on efficient energy use, e.g. Bavarian State Agency for the Environment has 10 general guidance papers (energy efficient use of compressed air, lighting systems, etc.), 15 branch specific guidance documents with examples (paper industry, paint shop, porcelain industry, plastics processing, glass industry ...)
Greece	√		National legislation concerning in particular heating boilers, water discharges
Latvia		√	
The Netherlands	√		All BAT documents are included in the Dutch bylaw 'appointed BAT documents'. Standard lists of measures per sector are used for proven energy efficient measures. Specific measures are usually coming from additional energy efficiency studies by sector organisations. Additional energy efficiency policy can be found at provincial level, which has to be implemented by environmental protection agencies.
Norway	√		A web-based benchmarking system has been built up allowing all members to extract information about their own energy performance in relation to other plants within the same industry branch. Every year industry network members feed data into the system in an easy way via the internet. A precondition for getting economic support to energy analyses was to take an active part in the benchmarking project. There is an increasing interest amongst industry in benchmarking the energy

			performance to define the “best industry practices” and various cost-effective ways of improving performance.
Poland		√	
Romania		√	
Spain	√		Researches, reports from prestigious sources, for example, from USEPA or EEA or scientific articles
Sweden	√		One important source when evaluation what represents BAT for the industrial sector in question can be energy consumption data from other operators in the sector. Sometimes there are also data available in research programmes
United Kingdom	√		Reviewing of position by analysis of published literature: few technical developments in the science and practice of energy efficiency are found.

#### 4.6.3.2 National sector-wise evaluation of BAT concerning energy efficiency

Some countries (Austria, Czech Republic, Latvia, Denmark, the Netherlands, UK) reported about national sector-wise evaluation of IPPC industries concerning energy efficiency in form of research studies, guidelines and other information.

**Table 4.4. National sector-wise evaluation of energy efficiency**

	Yes	No	Notes
Austria	√		The Federal Environment Agency published two studies on energy efficiency in selected industrial sectors.
Bulgaria		√	
Cyprus		√	
Czech Republic	√		Two studies on energy efficiency in industries: 1) Confrontation technological level of Czech Republic and European coking plants. 2003; 2) The issues of energy efficiency and the integrated permits of food industry and farming sector. 2007
Denmark	√		Guidelines from The Energy Agency
Finland		√	
Germany		√	
Greece	√		
Latvia	√		Study for Emission Trading Scheme in Latvia, 2004
The Netherlands	√		Sector-wise evaluation on an ad hoc basis.
Norway	√		A study of possible energy efficiency potentials in the food industry in 2007.
Poland	√		
Romania			No information available
Spain		√	
Sweden		√	
United Kingdom	√		Reviewing of this information and recently is updated reporting requirements through resource efficiency programme.

## 5. REPORTING AND SUPERVISION

### 5.1 *Monitoring and reporting systems of energy use and efficiency, parameters, frequency*

#### *Monitoring and reporting systems of energy use and energy efficiency*

A precondition for consistent monitoring and reporting are specific and enforceable permit conditions relating to energy efficiency. In most of the countries energy efficiency issues are addressed as part of the environmental inspections if they are relevant and if there are specific permit conditions.

Many countries (Spain, Sweden, Latvia, Cyprus, Finland, Poland, Romania, the Netherlands) have monitoring and reporting systems of energy use and efficiency in place, e.g. for large combustion plants as well as waste incineration plants. Depending on the permit conditions, annual reports contain information on energy use, monitoring and energy efficiency investments. Monitoring and reporting of CO<sub>2</sub> emissions is also carried out according to E-PRTR and ETS if the companies are above the threshold.

In some countries detailed records (fuel and electricity consumption) are required for other types of energy intensive installations. More detailed information is provided by Romania that requires for cement production with a production capacity over 500 tons per day: on-line monitoring of the flue gas emissions from clinker kiln; monthly reporting of the results, continuous measurements and daily internal evaluation of the energy specific consumption and annual report regarding energy efficiency (confidential data), as a part of the annual environmental report (see [www.arpmbc.ro](http://www.arpmbc.ro)).

In some countries (Bulgaria, Czech Republic) the permit contains relevant monitoring and reporting conditions and operators continuously record energy savings and report annually to the Regional Authority.

Other countries use specific energy efficiency reporting systems:

- In Finland voluntary energy saving schemes have separate reporting systems. However, results of these reporting systems can be used by competent environmental authorities as well.
- In United Kingdom there are a number of different energy efficiency schemes which have their own reporting requirements e.g. for trading schemes and government incentives designed to stimulate energy efficiency.

#### *Parameters monitored*

Many countries determine energy use and energy efficiency parameters that have to be monitored:

**Table 4.5. Monitoring Parameters**

Country	Parameters
Austria	quantities of thermal and electrical energy produced and measurement of CO <sub>2</sub> emissions
Finland	energy and fuel use, energy production, investments
Norway	kWh/t produced
the Netherlands	energy consumption and CO <sub>2</sub> emissions
Romania	flue gas parameters (CO, CO <sub>2</sub> , O <sub>2</sub> , temperature, gas-flow etc) – as a relevant indicator for the combustion efficiency; specific

	consumption of thermal energy; electricity specific consumption; total consumption of thermal energy or electricity, etc;
Spain	pollutant emissions to the air and fuel consumption
Greece	temperature, flow rates, etc.
Cyprus	Type of fuels/fuel and electricity consumption
Sweden	Energy consumption

### ***Monitoring frequency***

Only some countries reported about the frequency of monitoring:

- UK presents that monitoring is carried out by continuous monitors and other surrogate techniques and is available for inspection.
- Romania answers that it depends on the specific requirements of the installation: on-line monitoring of certain parameters; daily, monthly, quarterly, yearly measurements.
- In Sweden the operator monitors the consumption of energy continuously. Moreover, there is an obligatory legal request for operator self-monitoring that also covers energy issues.

### ***Receiver of report***

Many countries (Austria Bulgaria Germany Denmark, Finland, Norway, the Netherlands, Sweden, Spain, Poland, Greece, Cyprus, Latvia, Romania) submit yearly/monthly reports to the enforcement, licensing or supervising authority and/or ministry.

**Table 4.6: Receiver of reports**

<b>Country</b>	<b>Authority</b>	<b>Frequency</b>
Austria	Mostly district authority	Case specific
Bulgaria	Enforcement authority	annually
Czech Rep.	Regional authority	annually
Germany	Permitting authority	annually, 4 years
Denmark	Ministry of Environment/Municipality	at least annually
Finland	Supervising authority	annually
Norway	Pollution Control Authorities	annually
The Netherlands		annually
Romania	Regional Environmental Protection Agencies	different
Sweden	Competent authority	annually
Spain	Ministry of Industry	annually

Operators in Romania forward reports to the Regional Environmental Protection Agencies (the IPPC permitting authorities) and to the local (county) structures (commissariats) of the National Environmental Guard (the control authority in the field of environmental protection). According to the specific content of each report type, the reporting frequency is different (as exemplified above): monthly, quarterly, yearly.

## **5.2 Inspection or audit systems and follow-up**

### **5.2.1 Follow-up required by the authorities**

Inspections in all EU countries could be divided into three groups: routine or non-routine inspections and third – only if conditions are violated (reactive).

In the United Kingdom regular inspections are carried out, in Sweden Cyprus and Norway - as appropriate. In Czech Republic, Romania and Bulgaria the follow up is required too. In Spain follow up is required, but in case of large combustion installations, energy efficiency is followed up by Spanish government while regional governments inspect the compliance with the “autorización ambiental integrada” (integrated environmental) permit conditions. In Finland missing information in annual reports has to be supplied.

### **5.2.2 Energy efficiency in inspection or audit systems**

In this context inspections are carried out by the competent inspection authorities. Some companies use internal audits to audit themselves. They can use external audits as well. They are performed by independent external organisations. They are used to determine whether or not the company complies with ISO standard or EMAS. Audits must be objective, impartial and independent. The audit process must be systematic and documented (see ISO 9000).

In most of the countries energy efficiency issues are addressed as part of the environmental inspections if they are relevant and if there are specific permit conditions relating to energy efficiency. Different attitude to inspection and energy audit systems in connection with environmental requirements is observed in EU member states. Only some countries have specific requirements for energy audits (Romania, Greece and Spain). In Greece there is a newly established Energy Inspection authority which will focus on energy efficiency issues.

In Denmark, Finland and UK energy audits are prepared due to requirements of other schemes (e.g energy efficiency agreements). In Denmark individual companies within specified branches can make voluntary energy saving agreements with the Energy Agency. The agreement will include an energy management. In connection with the agreement there will be an intern audit by the operator. Inspection will be made by the competent authority. In Finland Motiva Oy has developed sector-specific guidelines for energy efficiency audits.

In Romania it is stipulated in the IPPC permit that a company under the provisions of IPPC Directive must perform an audit for energy efficiency. The audit frequency differs according to the “energy specificity” of the installations: yearly, each two/ three years, but an internal evaluation of energy efficiency has to be yearly performed and the results of it have to be included in the Annual Environmental Report. The National Environmental Guard, through its central, regional and local structures, carries out regular inspections in the IPPC installations.

## 6. OTHER INSTRUMENTS FOR ENERGY EFFICIENCY

There are other schemes placed in the Member States to reach energy efficiency in the industrial sectors. Most of the obligations have been set in United Kingdom where under all the schemes described below all installations are covered, except for domestic homes that are covered through building standards. Some of the countries have voluntary energy saving schemes (Finland, Denmark, Sweden and the Netherlands), CO<sub>2</sub> taxes (Latvia, Norway, Poland, Sweden, Finland and Denmark), climate-protection-agreements (Germany) and other instruments for participants of emission trading scheme and others.

### 6.1. Voluntary energy saving agreements in Member States

#### *The Netherlands*

It is widely accepted that for the evaluation of energy efficiency developments in the manufacturing industry, the use of physical indicators of activity, either stand-alone or in combination with monetary indicators, contributes to a better understanding of energy efficiency developments. In the Netherlands, physical indicators of activity have also been used intensively for energy efficiency monitoring within the framework of the two generations of Long Term Agreements (LTA-1 and LTA-2) and the Covenant Benchmarking energy efficiency. These agreements have been the main governmental policies to promote energy efficiency in the industrial sector in the Netherlands since the 1990s, supported by various other policy instruments summarised in Table 1 [11].

**Table 6.1. Policy instruments in the Netherlands for industrial energy efficiency in the period 1995 - 2003**

Instrument	Period
<i>Covenants</i>	
LTA-1	1989-2000
LTA-2	2001-2012
LTA-3 (non-ETS enterprises) and LEE (ETS enterprises)	2001-2020
Benchmarking covenant	1999-2012
Environmental Action Plan	1991-2000
<i>Regulations</i>	
Energy in the environmental permit	1993-present
<i>Fiscal instruments</i>	
Energy investment tax cut (EIA)	1997–present
Variable tax deduction (VAMIL)	1991–present
Regulating energy tax (REB)	1996–present
<i>Subsidies</i>	
Tenders industrial energy savings (TIEB)	1989–1999
Subsidy scheme for energy conservation techniques (BSET)	1993–1996
CO <sub>2</sub> reduction plan	1997–2002

The first generation of LTAs on energy efficiency (LTA-1) were voluntary agreements contracted in the period 1992–1996 between the Dutch government and particular sectors of industry. The LTA-1 aimed to increase the energy efficiency of a sector by 20% between 1989 and 2000. The objective was reached already in 1999 [13]. In 1999, the energy-intensive plants consuming more than 0.5 PJ per year signed the Covenant Benchmarking energy efficiency. In this covenant, running until 2012, they committed themselves to be among the world leaders in energy efficiency as soon as possible, but not later than 2012, resulting in required energy efficiency improvements



that vary per sector and depend on e.g. the current distance to the world top and the expected development of the world top over time.

Part of the less energy-intensive industries (companies with a yearly primary energy consumption below 0.5 PJ) signed the second generation of LTAs (LTA-2), also running until 2012. The LTA-2 does not focus on energy efficiency only, but also on other energy topics such as sustainable product development and renewable energy. Companies participating in the LTA-2 are obliged to set up an energy efficiency plan, which for a period of 4 years describes the goals with respect to energy efficiency improvements. For the first period (2001–2004), the goals for the 16 participating industrial sectors varied between 2.4% and 46% total efficiency improvement (0.8–14.3% per year), including improvements due to the use of renewable energy and sustainable product development.

LTA3 is the third version of this very successful instrument. The LTA-1 focused primarily on process efficiency. The second generation added energy savings outside of the immediate production processes, that is to say throughout the entire product chain. LTA3 presents an expansion, intensification and broadening of the LTA2 agreement. While LTA2 ran until 2012, the conversion to LTA3 implied an extension of the term until 2020. The aim of LTA3 is an average total efficiency improvement of 2 percent up to and including 2020: a very ambitious target. As a result, energy savings demand even more attention than before. In order to keep up this pace in the long run, preliminary studies and road maps were introduced into LTA3. These studies involve the formulation of a strategic outlook in which the sectors show which (non-) technological aspects are important to be able to meet the working hypothesis of a 50 percent improvement in energy efficiency in 2030 compared to 2005. After signing LTA3, companies started formulating energy efficiency plans.

The monitoring methodologies of the LTA-1, LTA-2 and LTA-3 and the Covenant Benchmarking are very strict and are based on confidential production and energy use data of the participating companies [14]. For the industrial sector, mainly physical production data are used. In the LTA-1 monitoring reports, improvement in the energy efficiency indicator determined by top-down indicators is explained by bottom-up overviews of implemented energy efficiency improvement measures. LTA-1 was reviewed by different studies from which the study conducted in 2002 [12] assessed the monitoring methodologies and also the quantitative results of the LTA-1 until 1996. They concluded that the monitoring methodologies of the LTA-1 were insufficiently transparent and recommended independent supervision and verification of the LTA monitoring results.

Study results [11] show that since the middle of the 1990s, significant energy efficiency improvements have been made in the industrial sectors studied. The efficiency improvements vary widely from sector to sector, from year to year and also between the various types of energy use distinguished (electricity, fuels/heat and non-energy use).

### ***Finland***

Finland has a long history from yearly 1990s in using voluntary energy saving agreements. Experiences from previous schemes have been used when setting up the newest Energy Efficiency Scheme which is targeted for years 2008-2016.

The Energy Efficiency Agreements play a key role in the implementation of the EU energy efficiency related legislation, especially the EU Energy Services Directive (2006/32/EC) and the EU climate action and renewable energy package.

The Energy Efficiency Agreements cover the major part of the energy use and production in Finland; industry, municipals, transport and buildings. All these sectors have their own agreements including all horizontal elements like auditing and reporting as well as sector specific features.

Companies which sign the Agreement are committed to do several things. They must commit in continuous improvement of the energy efficiency. This requires constant control of one's energy usage, as well as systematic monitoring and consideration energy efficiency in practices, procurements, uptake and maintenance. Everything is founded on the commitment by the management. Energy intensive industries have to implement Energy Efficiency System which is the way to do everything in a systematic way. An essential issue in the system is that all companies have to do an energy audit. Only companies doing this may get some subsidies from the state to do some energy efficiency investments.

A company joining the agreement scheme has to submit an annual report on the previous year's energy use and any related efficiency measures. The information is collected in a joint Internet-based monitoring system. The monitoring system provides information for the Ministry of Employment and the Economy, the industry associations, and organizations participating in the Agreements. Information is not provided to the environmental permit or supervision authorities because they are not partners in the Energy Efficiency Scheme.

### *Denmark*

The Danish scheme on voluntary agreements on energy efficiency in industry was launched in 1996 as part of the Green Tax Package [15]. The main objective of the Package was to reduce the CO<sub>2</sub> and SO<sub>2</sub> emissions from trade and industry. The Package comprised three policy instruments:

- Green taxes
- Subsidies
- Voluntary agreements (VAs).

The VA scheme mainly targets companies with relatively high energy use. The CO<sub>2</sub> tax and the VAs are differentiated between three energy applications:

- heavy process,
- light process and
- space heating.

All companies with heavy processes are eligible to enter a VA. Heavy processes include e.g. greenhouse heating and the production of foodstuffs, sugar, paper, cement and glass. Companies with light processes can enter a VA if the company's tax on energy use exceeds 4% of the company's value added.

The VAs contain a number of key elements which form the basis for the energy efficiency activities:

- the energy management system;
- the energy audit/energy flow screening;
- the special investigations;
- the energy saving projects (investments).



The initiatives to improve energy efficiency and reducing energy consumption have been modified in the beginning of 2010 due to law changes. The approach is anyway in principle the same. It is concluded that: Over a number of years, the production industries in Denmark have managed to stabilise their energy consumption and maintain considerable growth at the same time. The reason is that saving energy makes sense – also from a financial point of view. There are still considerable opportunities for companies to enhance their energy efficiency on a profitable basis. Danish industry itself estimates that Danish companies could, on average, and to their financial advantage, reduce their bills by approximately 15 per cent if they used energy more efficiently.

### ***Sweden***

Sweden has taxes, charges and voluntary systems which are not alternative provisions, but parallel.

On 1 January 2005, the Programme for Improving Energy Efficiency Act , PFE, came into force. The programme is intended to increase energy efficiency and create opportunities for tax exemption. On 1 July 2004, the tax on industrial process-related electricity was raised from SEK 0 to SEK 0.005 per kWh .The tax rise represents the adoption of the EU's Energy Tax Directive.

The Directive gives energy-intensive companies in manufacturing industry, which are subject to the tax, the opportunity of being granted tax exemption on their electricity consumption if they take action to improve their energy efficiency. The government has, therefore, adopted a programme of improving energy efficiency in energy-intensive companies (PFE), with the carrot of reduced taxation. Participation in the programme is voluntary, and is open to energy-intensive manufacturing companies which meet certain criteria.

The aim of the programme is partly to increase the efficiency of energy use among companies which consume large amounts of energy, i.e. energy-intensive companies. One measure to improve efficiency is to introduce an energy management system (EMS), the energy equivalent of an environmental management system.

The programme period for participating companies is five years. During the first two years of the programme period, the company must introduce and obtain certification for a standardized energy management system. An energy audit and analysis are used to generate a list of measures to improve energy efficiency, which the company then implements during the remaining three years of the programme. Since PFE focuses on electricity-efficiency, the priority is to list measures to improve the efficiency of electricity use.

### ***Germany***

In November 2000 the Federal Government reached a Climate-protection agreement with German industry . German industry has declared its willingness to reduce the specific greenhouse-gas emissions by 35 % by 2012. Associations of 19 industrial branches have signed the agreement (representing 80 % of energy consumption in the German producing industry). For monitoring the fulfilment of this agreement, the Federal Government has reached consensus with German industry regarding a systematic, transparent monitoring system. Regulations of the Ecological Tax Reform of 1999 were combined with the agreements. Manufacturing sector companies are granted so-called “net-burden compensation” (“Spitzenausgleich”). The European commission has approved the current net-burden compensation until 2012, if German industry meets the targets it

committed to in the climate-protection agreement of 9 November 2000. The German Federal Government plans that from 2013 on the net-burden compensation shall only be granted if certain targets are achieved and Energy Management Systems acc. to EN 16001 are established. [At the moment there are discussions that the “net-burden-compensation” may be totally abandoned due the economic crisis.]

The evaluation carried out in 2008 by Rheinisch Westfälisches Institut für Wirtschaftsförderung (RWI) showed that German industry had already met the target.

### *Norway*

An industrial energy efficiency network (“Bransjenettverket”) was established already in 1989 as an initiative of the Ministry of Petroleum and Energy (MPE) to stimulate efficiency measures. It started to play a more important role for identifying and realizing the industrial energy saving potential in the mid-90s. Network members can obtain grants to analyse the potential for energy savings and benchmark their performance against other companies. Approximately 900 companies are members and about 600 of mainly small and medium size enterprises (SMEs) have since 1996 got information and financial support for lowering their energy consumption by a variety of measures. The outcome of all these efforts has now been evaluated ex-post and the cost-efficiency can be estimated [16].

#### **6.1.1. Effect of voluntary agreements concerning energy efficiency**

A quantitative evaluation of the effect of voluntary agreements on energy efficiency can only be made if targets are well defined and the instruments include defined rules for monitoring and reporting. In some countries this was / is the case (see the Netherlands, Germany and Sweden). Sometimes the results are treated as confidential data. This causes problems concerning statistics. Another point of criticism is that voluntary agreements are often made with industrial associations and not with individual companies. In this case the fulfilment of targets is evaluated sector wise and not in relation to the individual site. So it is not guaranteed that all companies of a sector successfully have carried out measures. However the sector may have reached the target, because enough companies were very ambitious. Consequently it is not possible to conclude that companies generally fulfil the requirement of efficient use of energy on the basis of the results of voluntary agreements.

### **6.2. Environmental Management Systems**

On global, EU and national level there are different environmental management systems in place that are established by companies or organisations on a voluntary bases. Concerning energy efficiency the most important systems in Europe are EN 16001, ISO 14001 and EMAS. Their influence and importance will be discussed in this chapter.

The future ISO 50001 will establish a global framework for industrial plants, commercial facilities or entire organizations to manage energy. Targeting broad applicability across national economic sectors, the standard could influence up to 60 % of the world’s energy use. ISO 50001 will probably be adopted within a year and in the summer of 2011 at the earliest.

#### **6.2.1 EN 16001 Energy management systems**

The EU standard EN 16001 that came into force in June 2009 specifies requirements for an energy management system to enable an organisation to develop and implement a policy and objectives

which take into account legal requirements and information about significant energy aspects. It is intended to apply it to all types and sizes of organisations irrespective of any geographical, cultural and social conditions.

EN 16001 can be used independently or integrated with any other management system. The structure of this standard is similar to the structure of ISO 14001. It is based on methodology known as Plan-Do- Check- Act (PDCA).

The implementation of an energy management system specified by this standard is intended to result in improved energy efficiency. Therefore, it is based on the premise that the organisation will periodically review and evaluate its energy management system to identify opportunities for improvement and their implementation. The rate, extent and timescale of this continual improvement process are determined by the organization in the light of economic and other circumstances. Consequent implementation of the energy management system is intended to result in improvements in energy performance.

EN 16001 requires the organization to:

- Establish an appropriate energy policy;
- Identify the energy aspects arising from the organization's activities;
- Identify applicable legal requirements and other requirements to which the organization subscribes;
- Identify priorities and set appropriate energy objectives and targets;
- Establish a relevant structure and programmes to implement the policy and achieve objectives and meet targets;
- Facilitate planning, control, monitoring, preventive and corrective actions, auditing and review activities to ensure both that the policy is complied with and that the energy management system remains appropriate.

As the standard EN 16001 is a very young one its effect on energy efficiency and energy use in companies could not yet be evaluated in this project. It remained unclear whether it is attractive for companies. Being a European standard EN 16001 may be not very attractive for companies with worldwide activities. They would rather prefer an ISO 14001 management system.

### **6.2.2 ISO 14001 versus EN 16001**

The International Organization for Standardization published the environmental management standard ISO 14001 in 1996 which has been acknowledged world wide and can be used by all kinds of organisations. The Finish report identified that concerning energy efficiency the co-ordination of activities related to ISO 14001 standard and the permit and inspection aspects might lead to simplification of procedures and reduction of workload. A precondition for that was that certifiers pay more attention to energy efficiency issues. The doubtful legal status of voluntary systems was seen as a main problem. The situation has not changed since 2002.

Many companies are certified according to ISO 14001. Energy management is one criteria of the complex environmental management system of the 14001 standard, which does not prescribe any methods or measures. The ISO/PC 242 committee has analysed the requirements of EN 16001 in comparison to ISO 14001. It is shown that if companies have established a 14001 environmental management system basically they fulfil already many aspects of EN 16001. But especially they have to

- add the improvement of energy use and efficiency to their environmental policy
- define energy management as an important item
- define the boundaries of the energy management system
- define the targets for improvement in energy efficiency
- identify the most energy intensive parts and the possibilities for improvements
- determine measures and monitoring procedures.

The brochure “DIN EN 16001: Energy Management Systems in Practice – A Guide for Companies and Organisations” ([www.umweltdaten.de/publikationen/fpdf/4013.pdf](http://www.umweltdaten.de/publikationen/fpdf/4013.pdf)) contains a comparison table with details in Annex B.

### **6.2.3 EMAS and EN 16001**

EMAS (Eco-Management and Audit Scheme) is a voluntary environmental management system (EMS), under which companies and other organizations evaluate, manage and continuously improve their environmental performance. EMAS has been operative since 1995. The latest revision (EMAS III) came into effect on 11 January 2010. Currently, more than 4,400 organisations and approximately 7,600 sites are EMAS-registered.

The core elements of EMAS are performance, credibility and transparency. By carrying out annual updates of environmental policy targets and actions to implement and evaluate them, registered organisations continually improve their environmental performance and provide evidence that they comply with all environmental legislation that is applicable to them. Third-party verification from independent auditors significantly adds credibility to registered organisations by guaranteeing the value of both the actions taken and the disclosed environmental information. Transparency is generated by the environmental statement, which an organization is required to provide as part of EMAS registration. The communication tool makes available to the public information on the environmental impact and performance of the organization.

The requirements of ISO 14001 are part of EMAS and EMAS covers a wider range than ISO 14001. Thus for companies with an EMAS certificate it is even easier to fulfil the EN 16001 requirements. In Germany it will be possible for operators of EMAS sites to obtain the EN 16001 certificate with their EMAS validation if energy efficiency is a core item in their improvement program.

### **6.2.4 Effect of environmental management systems on energy efficiency**

ISO 14001 and EN 16001 are voluntary environmental management systems. Consequently companies are not obliged to publish the data of improvements due to the establishment of a management system. Operators of EMAS sites publish their environmental statement. But as measures and requirements for monitoring and reporting are not standardised it is not possible to estimate the quantitative effect of these systems on energy efficiency.

## 6.3 Energy Taxes, Grants and Subsidies

### 6.3.1 General considerations

#### Taxes

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

According to IPCC Fourth Assessment Report: Climate Change 2007 [5] tax reductions are frequently used to stimulate energy savings in industry. Some examples of energy efficiency tax policy are following:

- In the **Netherlands**, the Energy Investment Deduction (Energie Investeringsaftrek, EIA) stimulates investments in low-energy capital equipment and renewable energy by means of tax deductions (deduction of the fiscal profit of 55% of the investment).
- In **France**, investments in energy efficiency are stimulated through lease credits. In addition to financing equipment, these credits can also finance associated costs such as construction, land and transport.
- **Romania** has a programme where imported energy-efficient technologies are exempt from customs taxes and the share of company income directed for energy efficiency investments is exempt from income tax.

There is limited experience with taxing industrial GHG emissions. France instituted an eco-tax on a range of activities, including N<sub>2</sub>O. It provides a supplementary incentive for emissions reductions.

**Germany** has an eco-tax on the consumption of electricity, gasoline, fuel oil and natural gas. Revenues are recycled to subsidize the public pension system. The tax rate for electricity consumed by industrial consumers is € 0.012/kWh. Very large consumers are exempt to maintain their competitiveness. The impact of this eco-tax on CO<sub>2</sub> emissions is still under discussion.

In **Sweden** the PFE program is intended to increase energy efficiency and create opportunities for tax exemption. On 1 July 2004, the tax on industrial process-related electricity was raised from 0 to 0.005 SEK/kWh. The tax rise represents the adoption of EU's Energy Tax Directive. This directive gives energy-intensive companies in manufacturing industry, which are subject to the tax, the opportunity of being granted tax exemption on their electricity consumption if they take action to improve their energy efficiency. The government has, therefore, adopted PFE, with the carrot of reduced taxation. Participation in the program is voluntary, and open to energy-intensive manufacturing companies that meet certain criteria.

There are different ways how **UK** deals with energy efficiency. First of all they have industry that is focused under IPPC and there is specific application in national policy and these companies are introduced with that.

Three alternative energy tax systems are created in UK

- First is in connection with IPPC installations and they are subjects in emission trading scheme (ETS);



- if installations are not contained by ETS then they are covered by climate change agreement (CCA);
- if energy consumers are not under CCA then they are under Carbon Reduction Commitment (CRC).

The Climate Change Levy (charge) in UK is a tax on the use of energy in industry, commerce and the public sector and additional support for energy efficiency schemes and renewable sources of energy. But the Government recognises the need for special consideration to be given to the position of energy intensive industries given their energy usage, the requirements of the Integrated Pollution Prevention and Control regime and their exposure to international competition. Consequently, the Government has provided an 80% discount from the levy for those sectors that agree challenging targets for improving their energy efficiency or reducing carbon emissions. The UK Climate Change Levy applies to industry only and is levied on all non-household use of coal (0.15 UK pence/kWh or 0.003 US\$/kWh), gas (0.15 UK pence/kWh), electricity (0.43 UK pence/kWh or 0.0085 US\$/kWh) and non-transport LPG (0.07 UK pence/kWh or 0.0014 US\$/kWh). Industry includes agriculture and the public sector. Fuels used for electricity generation or non-energy uses, waste-derived fuels, renewable energy, including quality CHP, which uses specified fuels and meets minimum efficiency standards, are exempt from the tax. The UK Government also provided an 80% discount from the levy for those energy-intensive sectors that agreed to challenging targets for improving their energy efficiency. Climate change agreements have now been concluded with almost all eligible sectors.

CRC is a mandatory emissions trading scheme aimed at reducing UK carbon dioxide emissions and improve energy efficiency. It will affect up to 5,000 organisations, primarily large businesses and public sector organisations including government departments, universities, retailers, banks, water companies, hotel chains and local authorities. Those organisations using at least 6,000 MWh/year settled on the half-hourly market, representing an annual electricity bill of around £1 million, will have to participate in a mandatory 'cap and trade' scheme. Each year this will require them to monitor and report their energy use and surrender sufficient allowances to cover their carbon dioxide (CO<sub>2</sub>) emissions.

## **Subsidies**

Subsidies are used to stimulate investment in energy-saving measures by reducing investment cost. Subsidies to the industrial sector include: grants, favourable loans and fiscal incentives, such as reduced taxes on energy-efficient equipments, accelerated depreciation, tax credits and tax deductions.

Many developed and developing countries have financial schemes to promote industrial energy savings. A World Energy Council (WEC) survey in 2004 showed that 28 countries, most in Europe, provide grants or subsidies for industrial energy efficiency projects. Subsidies can be fixed amounts, a percentage of the investment (with a ceiling), or be proportional to the amount of energy saved.

Subsidies for industry may lead to energy savings and corresponding GHG emission reductions and can create a larger market for energy efficient technologies. Whether the benefits to society outweigh the cost of these programmes, or whether other instruments would have been more cost-effective, has to be evaluated on a case-by-case basis. A drawback to subsidies is that they are often used by investors who would have made the investment without the incentive. Possible approaches for improving their cost-effectiveness include restricting schemes to specific target

groups and/or techniques (selected list of equipment, only innovative technologies, etc.), or using a direct criterion of cost-effectiveness.

Investors particularly during after the economical crisis in different EU countries tend to have a weak capital basis. Development and finance institutions therefore often play a critical role in implementing energy efficiency and emission mitigation policies. Their role often goes beyond the provision of project finance and may directly influence technology choice and the direction of innovation.

### **6.3.2 Effect of energy tax systems and subsidies on energy efficiency**

The previous chapter described how Member States use tax systems and subsidies as incentives for companies and organisations to reach national targets. Some of them have made evaluation of the results and published them. It is acknowledged that tax and subsidy systems may be very effective and successful. But there is no EU wide systematic and quantitative evaluation available that could have been used for this IMPEL project.

## **6.4 Influence of Emission Trading Scheme on energy efficiency**

### **6.4.1 General considerations**

EU ETS is the world's first international company-level 'cap-and-trade' system of allowances for emitting carbon dioxide (CO<sub>2</sub>) and other greenhouse gases. The first period of ETS (2005-2007) was a so-called "learning phase" for checking up the implementation of the Kyoto protocol in 2008-2012. The core sectors included in the ETS are:

- Energy installations with rated thermal input above 20 MW,
- Mineral oil refineries,
- Coke ovens,
- Industries producing and processing ferrous metals,
- Mineral industries (including cement, lime, glass and ceramic production with different assigned capacities), and
- Pulp and paper industries.

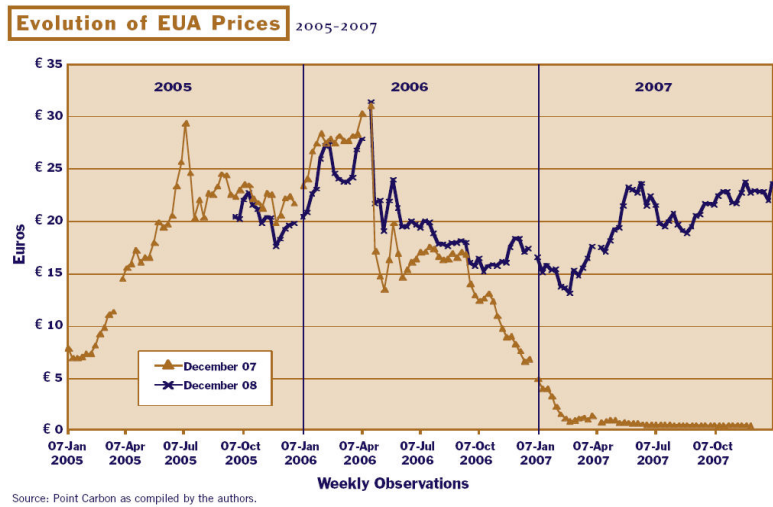
In 2012 the scheme will be joined by aviation sector but from 2013 as well capture other energy intensive industrial sectors, transport and geological storage of CO<sub>2</sub> will be included.

2003/87/EC does not include any provisions on energy efficiency for installations. Although there are no implications from EU, the scheme itself has a great impact on energy efficiency in installations, because the reduction of CO<sub>2</sub> emissions can be mainly reached by implementation of different measures like:

- fuel switch (replacing fuel with a higher emission factor by fuel with a lower emission factor);
- improving the energy efficiency of boiler and/or other installations at the company;
- improving the energy efficiency of the processes at the company;
- improving the arrangement of the heating network to reduce heat loss;
- improving consumers' energy efficiency.

As the results of the "learning phase" showed, more stringent emission caps had to be set for all Member States. This was done by European Commission already for the second phase (2008-

2012) and had a good impact on the EU emission allowances (EUA) price (see figure 6.1) as higher prices of allowances lead to greater incentives for energy efficiency at the installation level.



Source: Point Carbon as compiled by the authors.

**Figure 6.1. Evolution of EUA Prices [6]**

European Commission has worked out more severe rules for the third ETS phase (2013-2020).

#### **6.4.2 Consideration concerning quantitative effects of ETS on energy efficiency**

Targets concerning the reduction of CO<sub>2</sub> emissions are normally combined with measures of improvement in energy efficiency. Up to now there is no systematic evaluation of the quantitative effects of the measures available that could have been used for this project.



## 7 CONCLUSIONS

### 7.1 General conclusions

1. Energy efficiency is one of the key topics on the European level. It is one of the main approaches to reduce CO<sub>2</sub> emissions and increase the competitiveness. The potential to improve energy efficiency in industrial sectors is high and there are many tools available to increase it. One tool to improve energy efficiency in industry is to better utilize the requirement to use BAT to reach energy efficiency in the IPPC permit procedure.
2. The European Commission has published different sector specific guidance documents and horizontal guidelines on energy efficiency to improve the conditions for issuing the IPPC permits (BREF documents). Some of the countries have adopted them directly, others like United Kingdom and Finland have developed national specific guidelines for applicants to assist in the process. With the new IED Directive the BAT conclusions in the BREF documents will become more binding for all Member States.
3. The first evaluation of the energy efficiency in the environmental permits was performed 8 years ago. Since that only minor changes have occurred in the consideration of energy efficiency issues in permitting and supervising procedures. In Member States that recently joined to European Union energy efficiency has not been at the countries' political level among the main priorities.

### 7.2 Main challenges

The results of this evaluation of the current situation in Member States indicated 7 main challenges. These challenges should be addressed in the nearest future to increase the quality of the IPPC permits and to increase energy efficiency:

- a. Legal background – In the current IPPC directive it is not explicitly stipulated how energy efficiency is defined or should be addressed. However it is quite clear that BAT shall be used not only for emissions and waste prevention and minimisation but also for energy efficiency. The situation will be slightly improved in the future IE directive but not clearly enough. The requirements have been implemented in different ways in Member States. As a special case, realisation of combined heat and power is not always possible because of local reasons (e.g. whether the use of surplus heat is possible). Some (existing) industrial sites cannot fulfil this goal; however the application cannot be rejected on the basis of suboptimal site conditions; requirements for land-use planning (e.g. local, regional energy concepts) could be an option.
- b. Sector specific BREFs have until now not been concrete and precise enough regarding energy efficiency - although the horizontal BREF on energy efficiency techniques includes all major techniques to implement energy efficiency. However, to date this document has not been utilized much. The horizontal BREF on energy efficiency has been used mainly as a check list. It would be more user-friendly to incorporate the energy efficiency issues in the sector specific BREFs. The Guidance document on collection of data for the BREF work, IEF 20/4, emphasizes the need to improve the collection of data on energy aiming at BAT conclusion given e.g. as GJ/tonne of product.
- c. Lack of expertise in technical energy efficiency in authorities and companies. – Many authorities do not have the technical expertise to check the energy efficiency in detail.

- This means that operators must be very clear and comprehensive in their discussions with authorities and in their applications for permits.
- d. Lacking or only occasional cooperation between energy and environmental authorities or organisations which have specific knowledge in energy efficiency;
  - e. Permit revision – In many Member States there is no general approach to handle the item of energy efficiency in the permit revision. The individual legal background in the countries sometimes makes it impossible to integrate energy efficiency in the procedure. The individual legal background in the countries sometimes makes it difficult to consider energy efficiency in the procedure. It remained unclear whether in case of alterations of installations the overall efficiency will be assessed or only the efficiency of the changed part.
  - f. System boundaries and benchmarking - Defining the “system” and the resulting benchmark is a challenge. There is lot of information related to that in the ENE BREF. However: Due to site specific solutions it might at least for some installations be burdensome to compare the performance with available benchmarks. Concerning the system boundary the legal definition of an IPPC installation is rather narrow and does not extend to third parties
  - g. Unclear influence of environmental management systems, voluntary agreements, tax- and more profoundly, the overlap with the EU Emission Trading Scheme on energy efficiency - It is often assumed that the effects of measures carried out under these systems produce improvements in the energy efficiency performance of sites to such a degree so that it might not be necessary to deal with the item of energy efficiency in IPPC permitting and inspection. It remained open whether these systems are effective enough to fulfil the requirements of the IPPC directive concerning energy efficiency.

### **7.3 Good practice**

Many of the items of the report of the IMPEL project “Energy Efficiency in Environmental Permits” (finalised in December 2002) were examined again in 2010. The identified measures which could lead to a satisfying, consistent and transparent consideration of energy efficiency issues in permitting procedures were supplemented by updated information and other good practices were added. Besides, a key source for good practice, (i.e. more precisely BAT), is the BREF Energy Efficiency where many of the elements below are described as general BAT.

#### **1. Guidance**

Good practice identified by the project is the existence of horizontal and sector specific guidance on energy efficiency issues. National guidance is available in Finland and in United Kingdom where a revision of the guidance is under development. Although the horizontal BREF on energy efficiency was considered hard to use this document provides a good check list.

#### **2. Beforehand discussions and application forms**

As indicated already in the Finnish report, good practice would be that application forms with specific requirements concerning information on energy efficiency should be available. In Finland such application form is available (see Annex of the Finnish report). However this good practice has not been taken into account in other Member States. The template has to be updated.

### 3. Energy efficiency in permit conditions

According to Article 9 (1) of the IPPC Directive the permit has to include all measures necessary for compliance with the requirements of the Directive which inter alia is that energy is used efficiently by applying BAT. Workshop discussions showed that the participating countries have different systems for compliance monitoring in place. Some countries check the performance of installations by way of voluntary agreements between certain institutions and operator, frequent site visits and improvement programmes while other systems are based mainly on the permit and its conditions. Countries of the latter could therefore benefit from clear permit conditions regarding energy efficiency which can be monitored and enforced. This need was also expressed during the workshop.

The answers to the questionnaire made clear that at least in some countries more or less specific permit conditions regarding energy efficiency are a common practice. Examples for such permit conditions which could be regarded as a set of general minimum requirements for permit conditions are: monitoring of fuel and energy consumption, performance of recurring energy audits including submission of the evaluation to the competent authority, or alternatively establishment of an energy efficiency management system, obligation to draw up action plans/improvement programmes. They represent examples on the way towards finding BAT based measures for reaching energy efficiency.

### 4. Monitoring and supervision

Responses to the questionnaire and workshop discussions confirmed the approach expressed already in the Finnish report, namely, that adequate self monitoring is essential. Concrete permit conditions or agreements make it easier for authorities to check compliance.

Performance of energy audits and implementation of energy efficiency management systems is considered as part of BAT. Some countries (e.g. UK, Norway) require the implementation of such a system.

### 5. Co-operation

Information on energy efficiency is available from numerous sources and organisations. The problem is how the competent authorities can use this knowledge efficiently. Approaches to overcome this obstacle exist in some countries by way of involving energy agencies or other authorities in the permitting procedures depending on national structures.

### 6. Voluntary measures and incentives

Environmental management systems normally include the development of a company policy for energy efficiency. The EN 16001 provides useful guidance in this field. Some countries (e.g. some federal states in Germany) pay subsidies for initial energy efficiency checks. Others like UK, Finland, Denmark, Sweden use tax systems to encourage companies to improve energy efficiency on their sites.

### 7. Training

Generally the knowledge of environmental authorities in the field of energy efficiency seems not to have basically improved since 2002. It is good practice to provide good working material and training for environmental authorities. The project showed that this has still to be improved.

#### ***7.4 Proposals for further IMPEL work***

During the project the following proposals for further work of IMPEL were identified

- Development of a template for documents and data required regarding energy efficiency in the permit application
- Workshop on assessment of the application documents regarding energy efficiency (for new and existing installations) and development of permit conditions based on BREFs and other sources using a sector specific approach (e.g. food sector, metal processing sector, paper sector, chemical sector, waste treatment plants).
- Training course for dealing with energy efficiency in permitting and inspection.
- Integrating the discussion on energy efficiency into other sector specific IMPEL-projects, e.g. pig farming.
- Explore the overlap between EU ETS and IPPC which may negate the requirement to deal with energy efficiency under IPPC.

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